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ABSTRACT

This report presents existing workforce levels, training programs and career potentials and develops staffing level projections (1976-1982) based on available information for the State of Oklahoma. The study concerns itself with the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, wastewater, and energy. The format includes workforce profiles, projections, growth and career options for each of the areas investigated. Additional sections of the report outline state legislation and selected post secondary institutions with formal Environmental/Energy programs. A state profile and summary is included for cross-reference. The selected bibliography is appended in the Region VI report. This document is one in a series of 69 which presents information for each of the states, Washington, D.C., Puerto Rico, and the Virgin Islands, and national and regional summaries. (CS)

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A National Environmental/Energy Workforce Assessment

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SE 023 328

NATIONAL ENVIRONMENTAL/ENERGY

WORKFORCE ASSESSMENT

for

OKLAHOMA

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

1977

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Field
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PREFACE

The research and development of the NATIONAL ENVIRONMENTAL/ENERGY WORKFORCE ASSESSMENT project was conducted under the aegis of the U.S. Environmental Protection Agency by the National Field Research Center, Inc., Iowa City, Iowa, and the Denver Regional Office. This report is a summary of the State of Oklahoma and is one of five state reports within Federal Region VI.

The State of Oklahoma Report presents an overview of the current workforce, projections of workforce requirements (1976-1982), training and certification, and career potential in environmental pollution control and abatement. The environmental areas depicted within this report are: air, noise, pesticides, radiation, potable water, solid waste, waste water, and energy conservation/conversion.

FOREWORD

This state report is a summary of Phase I of the NATIONAL ENVIRONMENTAL/ENERGY WORKFORCE ASSESSMENT project in Oklahoma. The information contained within this report was obtained by extensive on-site interviews and research of project related materials. The information retrieval was conducted through representative federal, state, and when time allowed, local agencies. Telephone and written surveys were utilized as a secondary research source.

Data which is not documented herein is representative of the best professional judgements of experts currently working in the field.

This study is designed specifically for use as a reference tool at the federal regional level as well as at the state level. It is anticipated that the people of the State of Oklahoma will be the beneficiaries of this endeavor.

National Environmental Energy
Workforce Assessment

Phase I

OKLAHOMA

State Summary

I. AIR

Overall, the quality of the air resources in Oklahoma is good. Pollution problems are not severe and the state is developing a stringent program for preventing deterioration of Oklahoma's high air quality. The major sources of air pollution are industry, auto exhaust, open burning and other secondary manifestations of an increasingly affluent society. Oklahoma has been divided into six intrastate and two interstate Air Quality Control Regions (AQCR).

In 1967, the Oklahoma State Department of Health was designated as the official agency to assume administrative responsibility for air pollution control and abatement under the new Oklahoma Clean Air Act.

Under the Oklahoma Clean Air Act, the State Department of Health, Environmental Health Services, Air Quality Service has been designated as the responsible agency to administer the air pollution control and abatement program. Combining personnel, no more than 100 people are occupationally involved in air pollution control and abatement in Oklahoma.

Slight increases in workforce are forecast for Oklahoma to 1982. Across the state, the growth for air pollution control and abatement personnel will be approximately three percent per annum. Career opportunities will be available in air pollution control and abatement to 1985 in Oklahoma.

II. NOISE

At present, there is no state level program in noise pollution control and abatement in Oklahoma. No environmental noise legislation has been enacted. Although there has been no environmental noise legislation adopted by Oklahoma on the state level, local programs are ongoing to a minor degree in two locations. Responsibility for overseeing the noise program will be allocated to the State Department of Health, Environmental Health Services, Occupational and Radiological Health Services. This responsibility has been assigned although there are no personnel at present with full-time noise control activities.

State Department of Health officials have estimated that the workforce allocated to environmental noise control totals 20 across the state. This does not include the numerous secondary personnel, i.e., law enforcement officers who are involved with noise control but on a limited part-time basis.

Increases will occur across the state in industry and on the community level. A five percent per annum growth is anticipated for the community and industry noise control personnel.

Because the workforce in the area of noise pollution control is limited, there is little evidence that a significant number of career opportunities will develop over the next three to five years.

III. PESTICIDES

Pesticides personnel and practices in Oklahoma are becoming more sophisticated as increased research yields better and safer equipment and practices. Increased emphasis is being placed on education of applicators, dealers and manufacturers' agents.

The Oklahoma State Department of Agriculture, Entomology and Plant Industry Division has been allocated responsibility for pesticides usage, storage sales and training and certification of applicators. The protection of the state's people from chemical over-exposure is a major objective of this program. The state level workforce includes 26 personnel while the private category is composed of 2,495 commercial and 20,000 private applicators. Increases will be observed to a limited degree at the state level as well as within the ranks of the commercial applicator category. Private applicators will probably experience no increase in numbers since farming and ranching operations are consolidated due to increased operational costs. If changes occur within the private applicator designation, a slight decrease may be observed.

This field will continue to develop over the next decade as a result of increasing regulations and growing diversity and complexity of the pesticides being used. Consequently, a good deal of upgrading and continuing training for those already in the field will be necessary.

IV. POTABLE WATER

The State of Oklahoma has indicated intentions of assuming primary enforcement responsibilities for the Safe Drinking Water Act, P.L. 92-523. There is every indication that the state not only will assume "primacy" but will be one of the first states in the country to accomplish this.

Overall, the quality of Oklahoma drinking water is considered to be good. An extensive program of monitoring, surveillance, technical assistance and planning is currently ongoing across the state. The major problem related to drinking water is availability of supplies. Oklahoma is a water poor state.

The Oklahoma Department of Health, Environmental Health Services, Water Quality Service has been designated as the agency with primary responsibility for drinking water.

Due to the strong possibility of the state's assuming primary enforcement responsibility under the Safe Drinking Water Act, increases in the staff are anticipated over the next two years. At that time, few staff increases are anticipated for the subsequent two to four years. Growth should occur in operating personnel at approximately three to five percent per annum to 1982. If sound professional core personnel continue to develop, it may be the basis for attractive, though lesser skilled supportive positions. In addition to actual plant operation, research and development activities may well become one of the most promising fields in the future.

V.. RADIATION

Radiation control is a definite area of concern expressed by Oklahoma citizens. The use of radiation and radioactive materials is increasing in the state. Oklahoma does not have "agreement" status with the Nuclear Regulatory Commission (NRC). Although the state has not assumed agreement status and does not as yet have a nuclear power plant, other activities involving the use of radiation and radioactive materials are present across the state to varying degrees.

The Oklahoma statutes define the responsibility for the protection of the citizenry and the environment in radiation control. This responsibility has been delegated to the Oklahoma Department of Health, Environmental Health Service, Occupational and Radiological Health Service, Radiation Protection Division. In conjunction with the Division, a radiological health laboratory is responsible for contributing assistance to several national surveillance systems.

The Radiation Protection Division has doubled in staff number over the last two years. There are few changes indicated for this workforce over the next three to five years. Growth will occur in the private sector and at the local level. This anticipated growth is estimated at four to five percent per annum.

Career opportunities should be available in the field of radiation control in Oklahoma over the next three to five years. Highly skilled personnel in the sciences should be in demand.

VI. SOLID WASTE

According to Oklahoma state law, all incorporated cities shall adequately provide for the disposal of solid wastes generated or existing within the incorporated limits. There are presently 641 incorporated communities in Oklahoma. Of the incorporated communities of the state, 51% are presently considered to be in compliance. Unincorporated areas of the state are not addressed by the Oklahoma Solid Waste Management Act.

Legislative authority has designated the Oklahoma Department of Health, Environmental Health Services, Sanitation Service, Solid Waste Management Division as the lead state agency regarding solid waste management. Hazardous wastes also come under the aegis of this Division. The present Division staff includes 12 and the statewide workforce is composed of approximately 1,375.

An increased number of landfill operators, collectors and professional personnel are anticipated for the state level program and across Oklahoma. The state level personnel may double by 1982 to facilitate federal legislation. Private sector and local personnel will experience an approximate 4% per annum growth.

No certification is required for landfill operators in Oklahoma, and training on the local levels is not extensive. Certification of operating personnel would contribute to the safety of these persons. Certification is not thought to be a near future alternative, however.

VII. WASTEWATER

Under the Oklahoma statutes, the Department of Health, Environmental Health Services, Water Quality Service has been designated as the responsible agency with regard to water pollution control and abatement in Oklahoma.

The Water Quality Division is composed of three divisions: the Facilities Construction and Operations; Water Quality Monitoring and Research; and, Water and Wastewater Licensing and Training.

Currently in Oklahoma, there are approximately 500 to 600 wastewater treatment plants. The total number of certified operators has been estimated at 1,241, while there are approximately 600 uncertified operators, mostly helpers. There may, in addition, be another 200 persons occupationally associated with the wastewater field in Oklahoma.

The Water Quality Service is anticipated to experience an estimated five percent per annum increase for the next year and subsequently should illustrate an estimated three percent per annum growth to 1982. Approximately a three to five percent per annum growth may be anticipated for the wastewater treatment plant personnel, statewide.

There are a number of skill areas and degreed positions which are presently accessible to those entering the wastewater field. Increased automation will certainly have its effect on employment, but all indications point to an expansion of the wastewater control field.

VIII. ENERGY

Oklahoma ranks third among all U.S. states as an energy producer. But to offset this, the state is a major consumer of those energy products currently in short supply. An increasing concern to the citizens is the relative incompatibility of the production and use of energy on one hand, and the protection of the state's environment on the other.

There are two agencies which have been allocated energy related responsibilities in Oklahoma. These agencies are the Governor's Advisory Council on Energy and the Oklahoma Department of Energy. At present, the number of personnel working statewide in the energy and environmental control area is not known.

The Governor's Advisory Council on Energy as an advisory body may be increased or decreased at any time by the Governor. Staff projections for this committee are unrealistic. The Oklahoma Department of Energy is not able to make firm projections at present. However, staff increases are anticipated over the next three to five years, if only on a three to four percent per annum growth rate.

Options and availabilities of careers will be numerous and representative of a vast range of occupations. Degreed level and higher educational requirements will define the greatest portion. Engineering and scientific personnel with nuclear, coal, geothermal and solar expertise will be specific areas of knowledge that will be in demand.

STATE OF OKLAHOMA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	128	131	135	140	144	147	3%
NOISE[1]	33	35	37	39	41	43	5%
PESTICIDES[2]	2,521	2,597	2,675	2,755	2,838	2,923	3%
POTABLE WATER	2,535	2,625	2,722	2,816	2,912	3,031	4%
RADIATION	1,013	1,056	1,101	1,150	1,199	1,240	4%
SOLID WASTE	1,387	1,436	1,490	1,547	1,581	1,636	3%
WASTEWATER	2,087	2,171	2,260	2,350	2,404	2,527	4%
ENERGY	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTALS	9,704	10,051	10,420	10,797	11,119	11,547	4%

[1] Includes part-time state level personnel.

[2] Does not include private applicators.

EDUCATION

Oklahoma currently has a wide range of environmental/energy related courses and programs which lead to degrees from the Associate to the Doctoral level. For the most part, however, Associate level programs are more prevalent than are Bachelor or post-graduate courses and/or programs.

Oklahoma State University (OSU) has several environmentally related programs and is in the process of expanding the engineering curriculum to include a B.S. degree. A Bioenvironmental Engineering major program is available at the Master's level. Courses are also offered at OSU in Environmental Science which lead to a Master's or Doctor's degree. The Technical Institute at Oklahoma City is a division of the OSU College of Engineering. Two year programs are available leading to an Associate of Science degree in Environmental Health and Environmental Safety.

Environmental Engineering is available through the state system which may lead to an Associate degree at Cameron University, Claremore Junior College, Connors State College, and Eastern Oklahoma State College.

Oscar Rose Junior College at Midwest City (ORJC) offers the Associate in Applied Science (A.A.S) in two areas of environmental science, which include a general degree in environmental science and a degree in waste-water technology.

LEGISLATION

The environmental/energy legislation for Oklahoma was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Pollution Control Coordinating Act

Oklahoma Clean Air Act

Noise Control Act

Pesticide Applicators Law

Pesticide Law

Ionizing Radiation Protection Law

Solid Waste Management Act

Water and Sewage Works Operators Certification Act

Water Pollution Control Laws

National Environmental Energy
Workforce Assessment

Phase I

OKLAHOMA

State Report

STATE PROFILE

Oklahoma, "The Sooner State", ranks 18th in the nation in land mass with 69,919 square miles. The state topography includes isolated groups of mountainous wooded highlands as well as treeless plains and prairies.

The type of climate is predominantly continental, with pronounced daily and seasonal temperature changes. Summers are long and sometimes very hot, mitigated by low humidity and southerly breezes. Winters are cold but relatively short.

Indians represent 3.8% of the state's population. Representatives from the tribes include Cherokee, Chickasaw, Choctaw, Creek, and Seminole.

The population from the 1970 census was 2,559,253, an increase of 9.9% over the 1960 figures. Of the population, 68% is urban and 32% is rural. Population density averages 37.2 persons per square mile. The largest cities include: Oklahoma City, industrial and financial center of the state; Tulsa, centers for oil production and agricultural trading; Lawton, center of agricultural industries; and Norman, site of the University of Oklahoma. Over 100,000 students are enrolled in Oklahoma's universities and colleges.

Agriculture in Oklahoma is diversified with strong concentration on the production of cattle, wheat, dairy products, and hay. Farms in 1970 numbered about 90,000, totaling some 37,200,000 acres, averaging 413 acres each.

Mineral resources include petroleum, natural gas, and natural gas liquids. Oklahoma ranks third in the country in natural gas production and fourth in petroleum.

POLLUTION CONTROL AND ABATEMENT AGENCIES

The following agencies are those which are involved with environmental programs within the state. Each narrative provides a review of the functions and activities of each agency as they relate to environmental programs.

OKLAHOMA DEPARTMENT OF POLLUTION CONTROL

The Pollution Control Coordinating Act, as amended 1971, established the Department of Pollution Control as it is known today. The Department, however, was originally created in 1968. At that time it was administered by a board which was composed of the directors of five state agencies with responsibilities in the area of water pollution control and abatement. The Board was known as the Pollution Control Coordinating Board.

The Board today is still called the Pollution Control Coordinating Board. Memberships and responsibilities have been increased as a result of the amended Act of 1971. The executive component of the Board is the Department of Pollution Control.

In an effort to prevent duplication of effort, the Board coordinates the activities of all state agencies with environmental pollution control and abatement responsibilities. These member agencies include:

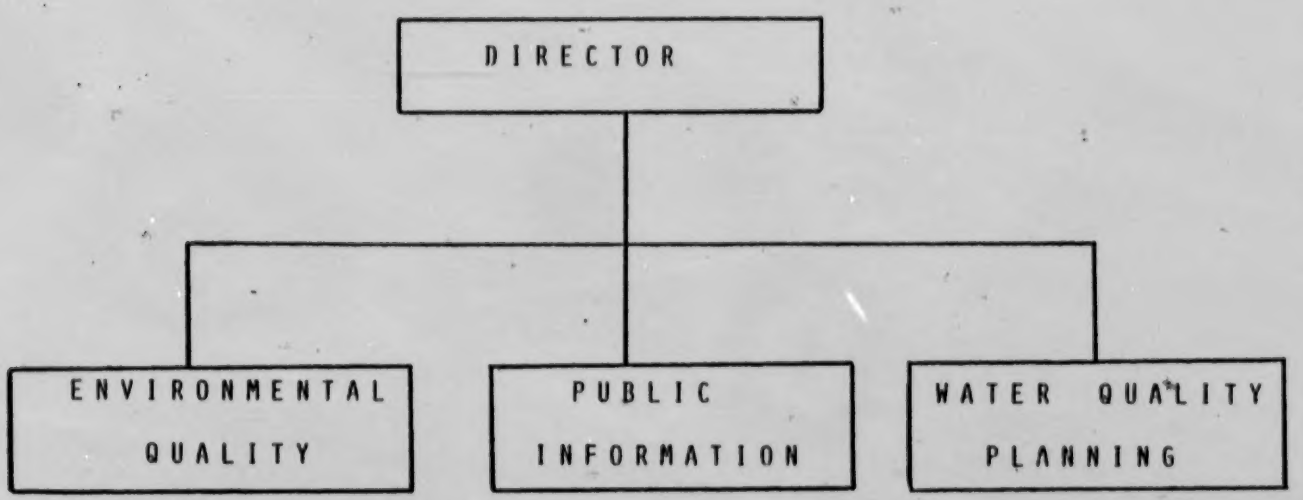
- Department of Health;
- Water Resources Board;
- Board of Agriculture;
- Corporation Commission;
- Department of Wildlife Conservation;
- Industrial Development Department;
- Conservation Commission;
- Department of Pollution Control.

An organizational chart is included in the following pages.

OKLAHOMA DEPARTMENT OF POLLUTION CONTROL

ORGANIZATIONAL CHART

Figure 1



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STATE DEPARTMENT OF HEALTH

The State Department of Health and the 60 county health departments compose Oklahoma's public health system. Activities included within the Department's responsibilities are establishing priorities to meet the health needs of the state, and enforcement of health, sanitation and safety measures. The responsibilities are allocated by program to the divisions which are called Services and include the following:

- Administration Service;
- Personal Health Services;
- Local Health Services;
- Health Facilities Service; and,
- Environmental Health Services.

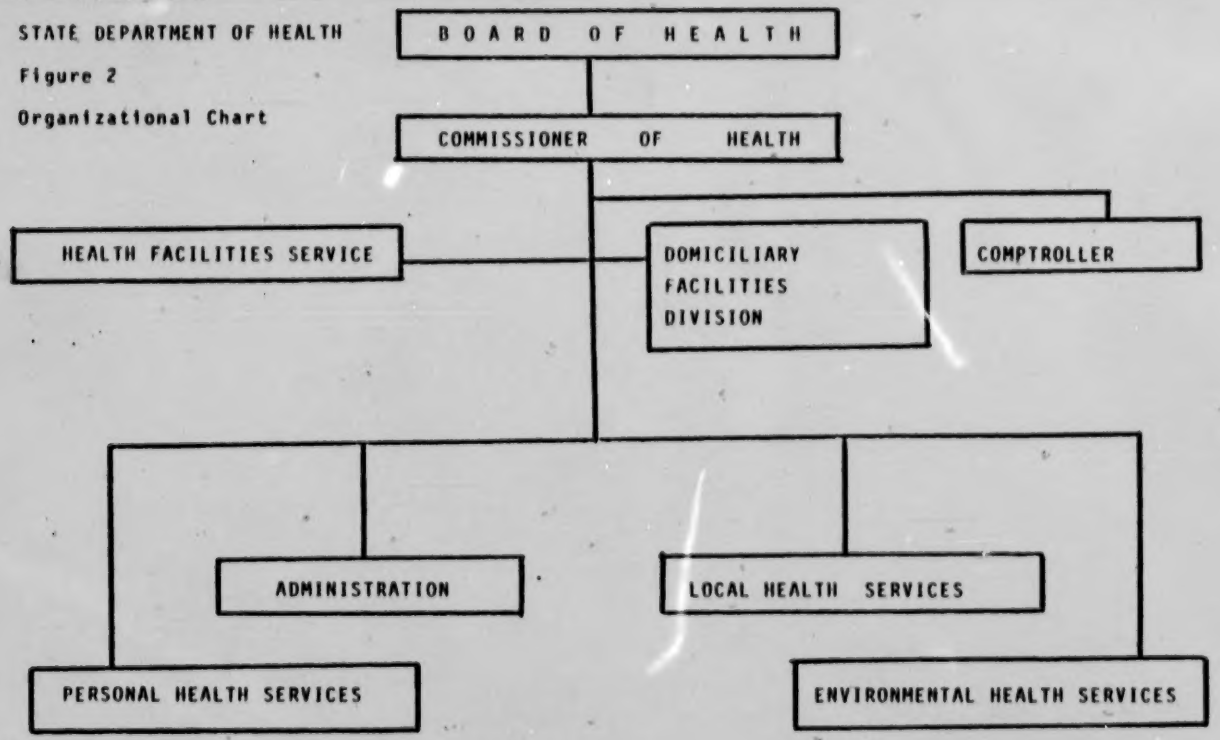
The Environmental Health Services includes the Air Quality Service; Water Quality Service; Sanitation Service; Consumer Protection Service; and the Occupational & Radiological Health Services. Organizational charts on the following pages illustrate the Department of Health.

OKLAHOMA

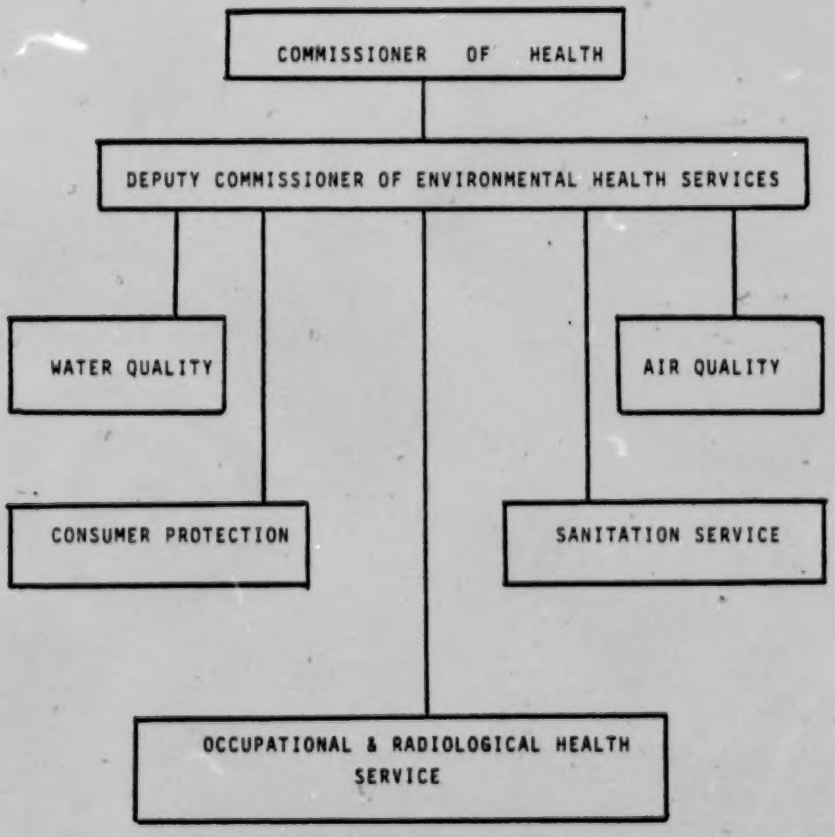
STATE DEPARTMENT OF HEALTH

Figure 2

Organizational Chart



STATE OF OKLAHOMA
DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SERVICES
Figure 3 Organizational Chart

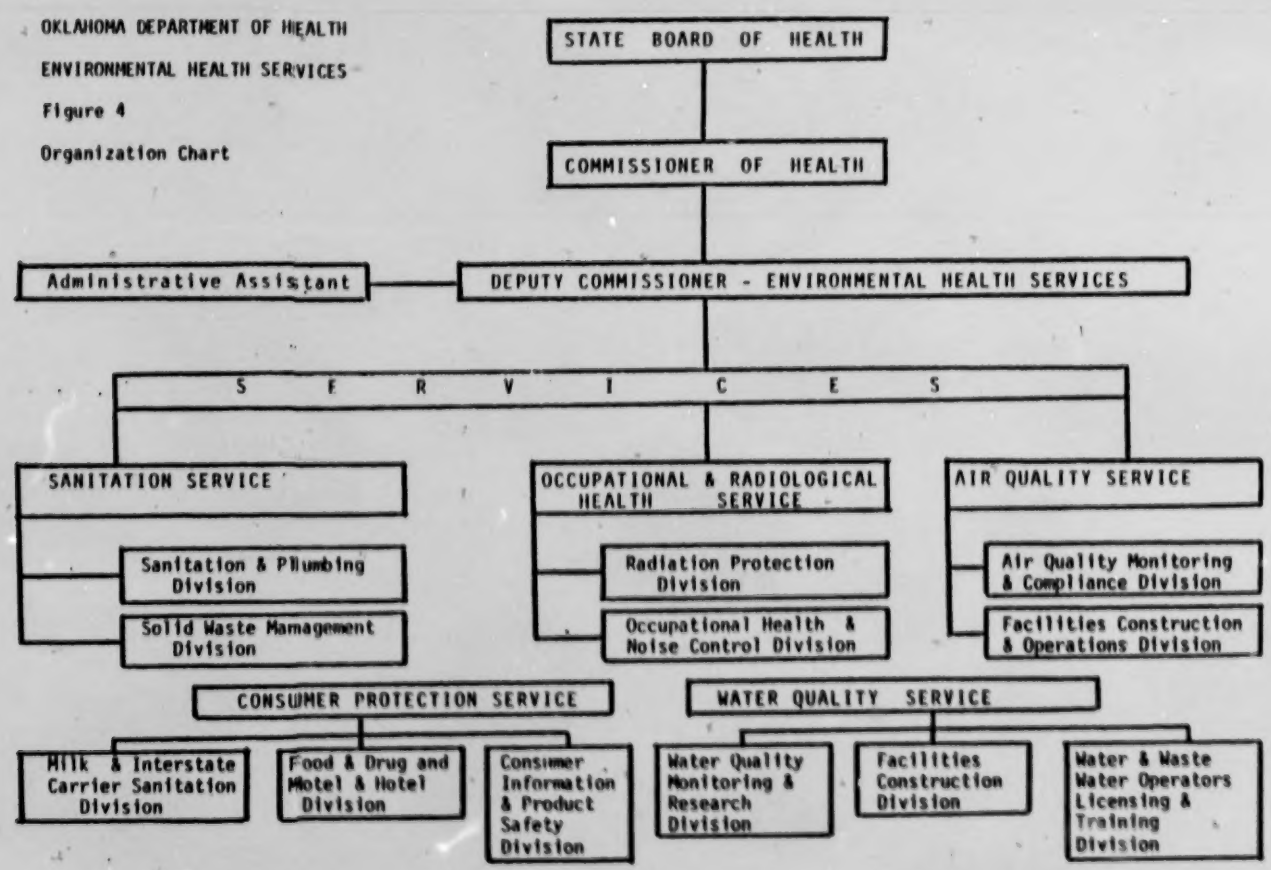


OKLAHOMA DEPARTMENT OF HEALTH

ENVIRONMENTAL HEALTH SERVICES

Figure 4

Organization Chart


STATE BOARD OF HEALTH
COMMISSIONER OF HEALTH
Administrative Assistant
DEPUTY COMMISSIONER - ENVIRONMENTAL HEALTH SERVICES
S E R V I C E S
SANITATION SERVICE
Sanitation & Plumbing Division
Solid Waste Management Division
OCCUPATIONAL & RADIOLOGICAL HEALTH SERVICE
Radiation Protection Division
Occupational Health & Noise Control Division
AIR QUALITY SERVICE
Air Quality Monitoring & Compliance Division
Facilities Construction & Operations Division
CONSUMER PROTECTION SERVICE
Milk & Interstate Carrier Sanitation Division
Food & Drug and Motel & Hotel Division
Consumer Information & Product Safety Division
WATER QUALITY SERVICE
Water Quality Monitoring & Research Division
Facilities Construction Division
Water & Waste Water Operators Licensing & Training Division

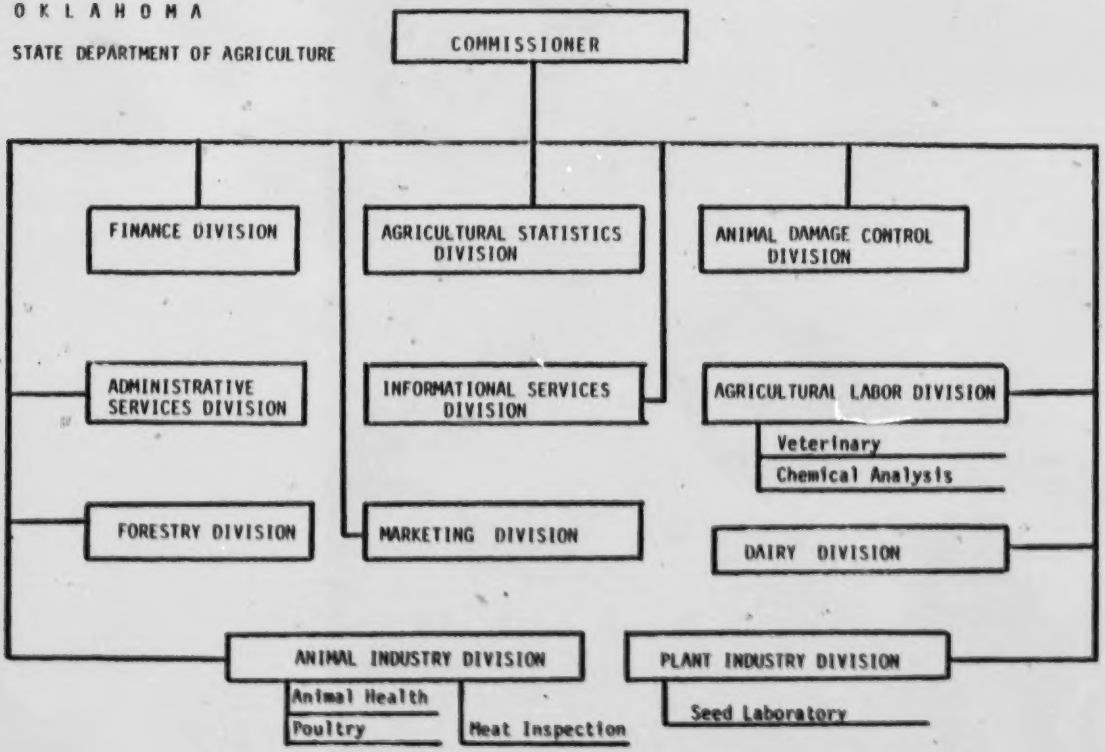
STATE DEPARTMENT OF AGRICULTURE

The Department of Agriculture is the agency with primary responsibilities for pesticides related activities and programs. The Department exercises this responsibility through the Entomology & Plant Industry Division. Several areas of responsibility are defined for this Division. Included are: pesticide registrations, certification and training of applicators, and enforcement. The Division is detailed in depth in Section III entitled "Pesticides."

Figure 5 ORGANIZATIONAL CHART

O K L A H O M A

STATE DEPARTMENT OF AGRICULTURE



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OKLAHOMA WATER RESOURCES BOARD

The Oklahoma Water Resources Board is responsible for control of water pollution from all industrial sources with the exception of the oil and gas industry.

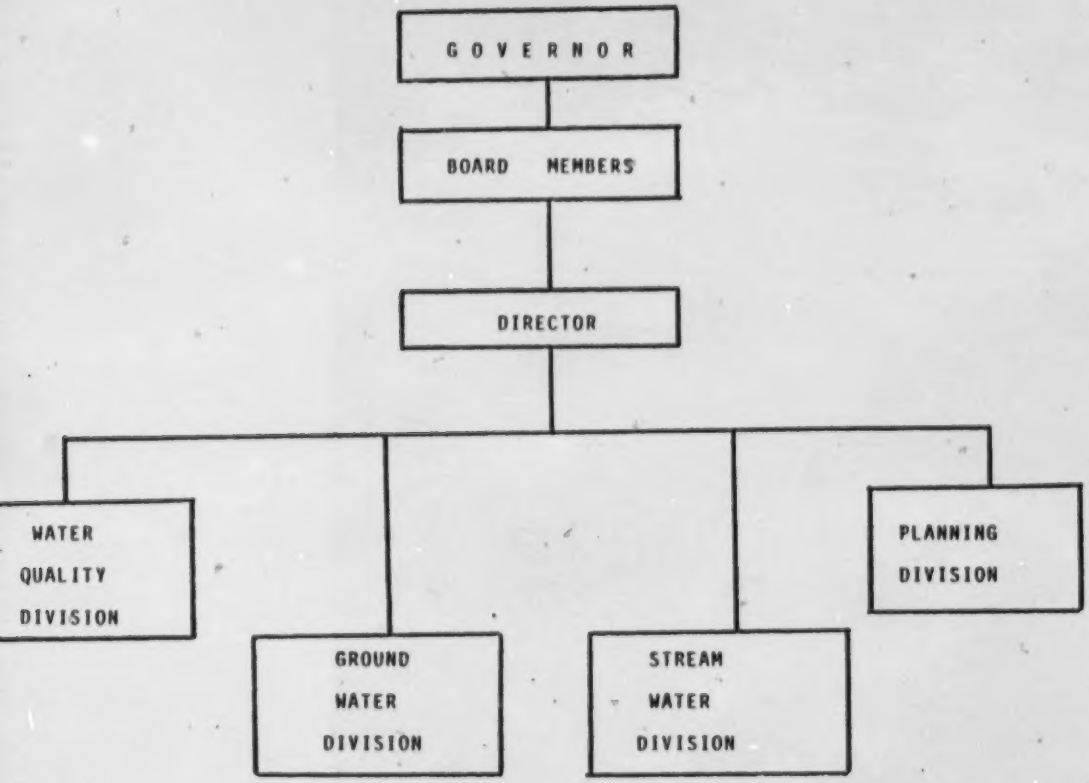
The Board was created in 1957 as a governing body to plan, develop and protect Oklahoma's water resources.

The Board has developed field and laboratory support capability and expertise in both chemical and biological fields.

Historically, the Oklahoma Water Resources Board was responsible for preparing and publishing the state's water quality data. The Board works cooperatively with the U.S. Geological Survey. Presently, 60 mineral quality trend stations have been established statewide.

OKLAHOMA WATER RESOURCES BOARD

Figure 6 Organizational Chart

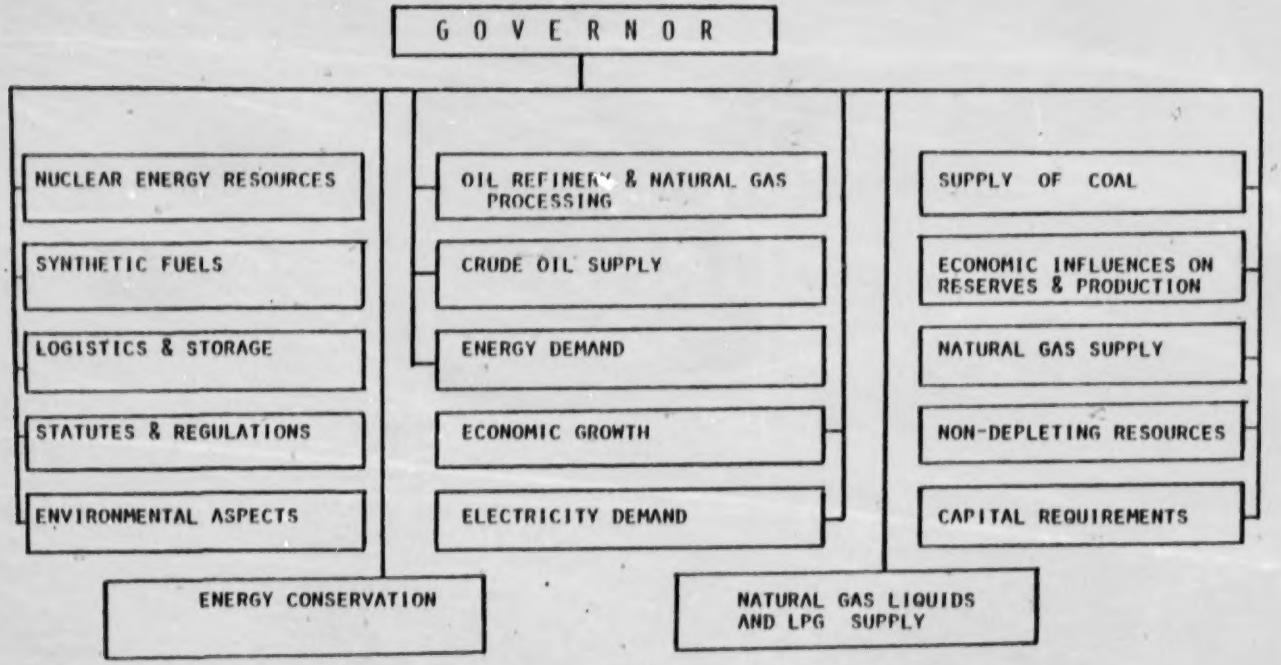


OKLAHOMA ENERGY ADVISORY COUNCIL

The Oklahoma Energy Advisory Council was created in 1973 as an advisory body. Several times since that date, the Council has been reorganized. Today, it includes 17 working committees which evaluate and project the state's energy supply and demand requirement to 1990. Since 1973, the Council has been examining the state's energy system. More than 180 persons have contributed to this effort.

Figure 7

OKLAHOMA STATE ENERGY ADVISORY COUNCIL ORGANIZATIONAL CHART



Pollution Control and Abatement Programs

I. AIR

A. Introduction

Overall, the quality of the air resources in Oklahoma is good. Pollution problems are not severe and the state is developing a stringent program of prevention of deterioration of Oklahoma's high air quality.

The major sources of air pollution are industry, auto exhaust, open burning and other secondary manifestations of an increasingly affluent society.

Oklahoma has been divided into six intrastate and two interstate Air Quality Control Regions (AQCR). These regions are described as follows:

Intrastate AQCR's:

- Central Oklahoma;
- Northeastern Oklahoma;
- Eastern Oklahoma;
- North Central Oklahoma;
- Southwestern Oklahoma; and,
- Northwestern Oklahoma.

Interstate AQCR's:

- Fort Smith Interstate; and,
- Shreveport - Texarkana - Tyler Interstate.

Oklahoma had no regulations or legislation which controlled air pollution prior to 1959. However, in 1961 the State Department of Health was given responsibility to conduct research studies. The results of these studies indicated that the air pollution that was identified in Oklahoma was localized. As would be expected, the greatest problems occurred in and near the largest cities.

In 1967, the Oklahoma State Department of Health was designated as the official agency to assume administrative responsibility for air pollution control and abatement under the new Oklahoma Clean Air Act.

In conjunction with the designation of the lead agency, a seven member Air Pollution Council was established. Duties of the Council include:

- Development of rules and regulations;
- Conducting of public hearings; and,
- Granting of variances.

In 1974 the U.S. Environmental Protection Agency designated two areas of the state as Air Quality Maintenance Areas (AQMA). The AQMA's include:

- Central Oklahoma AQMA, including Oklahoma County and parts of Canadian and Cleveland Counties; and,
- Tulsa AQMA, including Tulsa County and parts of Rogers, Wagoner, Creek and Osage Counties.

B. Workforce Profile

Under the Oklahoma Clean Air Act, the State Department of Health, Environmental Health Services, Air Quality Service has been designated as the responsible agency to administer the air pollution control and abatement program. The following table details the current staff of this agency.

There has been almost no turnover in the last two years in the Service due to higher salary levels and increased job satisfaction.

OKLAHOMA STATE DEPARTMENT OF HEALTH

ENVIRONMENTAL HEALTH SERVICES

AIR QUALITY SERVICE

Figure 8 Organizational Chart

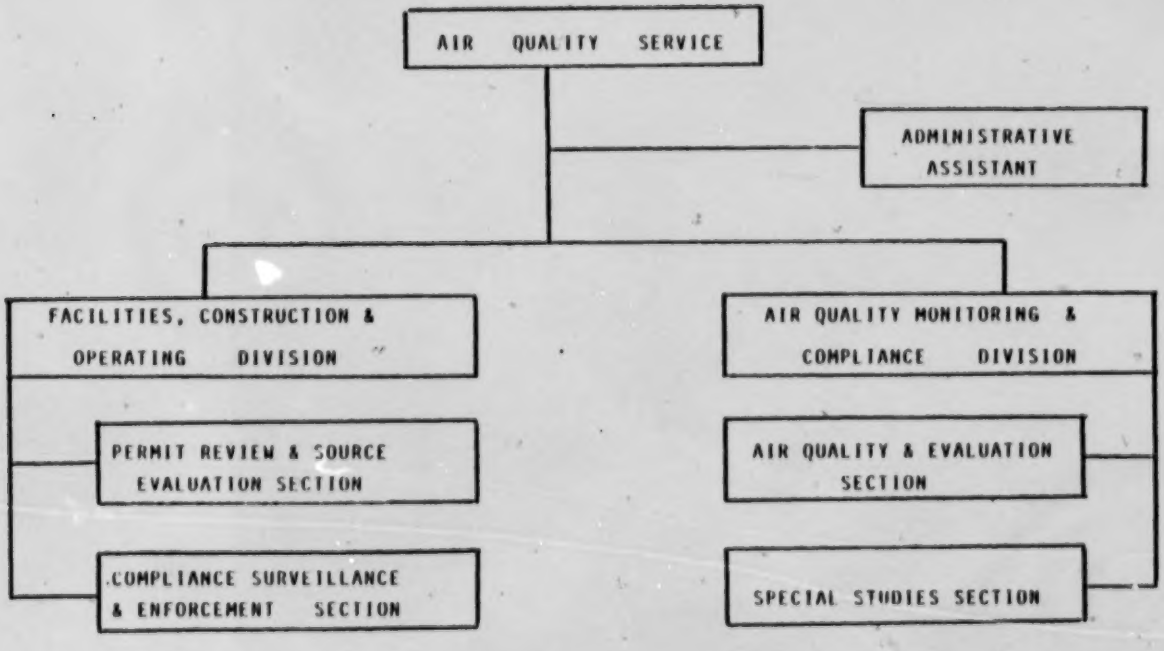

AIR QUALITY SERVICE
ADMINISTRATIVE ASSISTANT
FACILITIES, CONSTRUCTION & OPERATING DIVISION
AIR QUALITY MONITORING & COMPLIANCE DIVISION
PERMIT REVIEW & SOURCE EVALUATION SECTION
AIR QUALITY & EVALUATION SECTION
COMPLIANCE SURVEILLANCE & ENFORCEMENT SECTION
SPECIAL STUDIES SECTION

TABLE I

OKLAHOMA STATE DEPARTMENT OF HEALTH

Environmental Health Services
Air Quality Service
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Administrator	3	0%
Environmental Program Specialist	5	1%
Chemist	3	1%
Engineer	2	1%
Sanitarian	11	2%
Secretarial	4	N/A
TOTAL	28	N/A

The Air Quality Service conducts the following activities in pursuit of efficient administration of the Act:

° Monitors ambient air;

° Operates sampling stations;

° Develops control regulations;

° Enforces applicable laws; and,

° Conducts studies to determine major causes of air pollution.

There are additional personnel working in city and county programs across the state. The total number of people working on the local level is approximately 60. Combining the estimated industrial personnel, no more than 100 people are occupationally involved in air pollution control and abatement in Oklahoma.

C. Workforce Projections

The Air Quality Service has experienced rapid and substantial growth since designation by the Act as the lead agency in air

quality control. Very slight increases in staff are projected for this program workforce. This growth is depicted in the table below.

Information relative to the workforce profile and projections was obtained by means of on-site interviews and telephone conversations.

TABLE II

OKLAHOMA DEPARTMENT OF HEALTH

Environmental Health Services
Air Quality Service
Workforce Projections to 1982
(estimated)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	3	3	3	3	3	3	0%	0%
Environmental Program Specialist	5	5	6	6	6	6	1%	4%
Chemist	3	3	3	4	4	4	1%	7%
Engineer	2	2	2	3	3	3	1%	10%
Sanitarian	11	11	11	11	11	11	2%	0%
Secretarial	4	4	4	4	5	5	N/A	5%
TOTAL	28	28	29	31	32	32	N/A	2%

The statewide personnel described as approximately 100 in number should experience a three percent per annum increase to 1982. The following table approximates these increases.

TABLE III

STATE OF OKLAHOMA

Air Quality Control Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
State & Local Personnel	60	61	62	63	64	65	*	2%
Industrial Personnel	40	42	44	46	48	50	*	4%
TOTAL	100	103	106	109	112	115	N/A	3%

* unavailable

D. Training and Certification

The personnel development and training program of the Air Quality Service is designed to develop occupational skills in order to better execute the Clean Air Act of Oklahoma and the Federal Clean Air Act. Another function of this program is to provide an opportunity for individual self-development. This leads personnel to eligibility for in-service study and personal career developments.

The training plan of the Air Quality Service consists of two programs: in-house, on-job-training; and, training courses, offered externally by the EPA, other agencies, and industry. The internal training consists of informal classes which utilize on-the-job training under a supervisor's guidance. Other in-house training courses, consisting of taped lectures and workbooks, concentrate on

air pollution control orientation, as well as visible emissions and odor evaluation. Upon completion of the orientation course, a test is administered to determine retention and comprehension. The student must show proficiency in visible emissions in order to be certified as a Smoke Reader.

External courses conducted by the EPA include Principles and Practices of Air Pollution Control. Various technical and management courses are also conducted by the Environmental Protection Agency and industry. Courses are selected for personnel based upon their present job needs and their future interests. For example, field inspectors scheduled to start work in source evaluation would be scheduled for stack sampling training.

Upgrade training is divided between in-house and external courses. In-house training is conducted at the monthly Environmental Services and Air Quality Service staff meetings. These sessions include service and staff policies, as well as technical and taped lectures with accompanying slides and films. Smoke Readers' Schools are conducted by the Service twice annually. Visible emissions evaluators, or Smoke Readers, must be recertified every six months.

The Air Quality Service attempts to provide at least one training course to each employee per fiscal year. Basic orientation consists of two internal training and one external training courses. Personnel are required to participate in at least two of these courses.

The Oklahoma State Department of Health and the Air Quality Service is centrally located near three universities and several small colleges. Personnel are encouraged to participate in evening classes to complete degree work as well as advanced degrees.

E. Career Potential

Career opportunities will be available in air pollution control and abatement to 1985 in Oklahoma. Engineers, inspectors, sanitarians, as well as meteorologists and computer programmers should be in demand. Increased specialized training will be necessary. Technicial level persons will require increased training as the technology of air pollution control advances.

F. Conclusion

The overall air quality in Oklahoma is considered good. Problems are not severe and, as would be anticipated, are localized near the areas of high population and industrial concentration.

Career opportunities will be available as the state continues to pursue a program of preventive air quality control. Oklahoma has the advantage of being able to control new sources while at the same time not having an extensive number of established problems. As of June 1976, the state had identified 120 major facilities capable of emitting over 100 tons of pollutant each year. Of this total, 103 were in compliance, 12 in violation and five unknown.

II. NOISE

A. Introduction

At present, there is no state level program in noise pollution control and abatement in Oklahoma. Noise legislation includes House Bill 163 which was enacted in 1971.

The federal government has been granted authority to set regulations to control certain sources of noise. This authority was allocated under the Noise Contol Act of 1972. Currently these regulations affect interstate motor carriers weighing in excess of 10,000 pounds.

Although there has been no extensive noise legislation adopted by Oklahoma on the state level, local programs are ongoing to a minor degree in two locations, as a result of H.B. 163.

B. Workforce Profile

Responsibility for overseeing the noise program has been allocated to the State Department of Health, Environmental Health Services, Occupational & Radiological Health Services. This responsibility has been assigned on the organizational chart although there are no personnel at present with full-time noise control activities. Approximately 25% of this Division's time is allocated to the investigation of complaints regarding excessive noise. These personnel also act in an advisory capacity to the private sector when time permits.

Presented below is the full staff of the Occupational & Radiological Health Service. Equivalent workforce figures have been assigned in the column indicated as the 1976 total.

TABLE IV

OKLAHOMA STATE DEPARTMENT OF HEALTH

Occupational & Radiological Health Services
(Indicating Equivalent Noise Personnel)
Current (1976) Staffing Level

Position	(a)	1976*	%/annum turnover (average)
Director	1	.50	0%
Engineer	2	.0	5%
Environmental Health Specialist	3	.0	5%
Sanitarian	3	.0	8%
Chemist	1	.0	5%
Biologist	1	.0	5%
Secretarial	2	.0	N/A
TOTAL	13	.50 F.T.E.	N/A

(a) actual staffing levels of Service;
* indicates full-time equivalent.

It may be surmised, therefore, that approximately one person, the Chief, Occupational & Radiological Health Services, is responsible for the state noise control effort.

There are two communities in Oklahoma at present which have established municipal noise ordinances. The table which follows details these two cities and the regulations which are currently in force.

Oklahoma City and Tulsa are cities in the state with populations of approximately 330,000. By examination of the table it will be seen that Oklahoma City is alone in having a zoning regulation with acoustical criteria. The nuisance regulations in Oklahoma City and Tulsa both lack acoustical criteria. These ordinances then are not performance regulations as the Oklahoma City regulation is described.

Ordinances without acoustical criteria are without noise emission limits. Because they are non-quantitative they are difficult to enforce.

State Department of Health officials have estimated that the workforce allocated to environmental noise control totals 20 mostly part-time, across the state. This does not include the numerous secondary personnel, i.e., law enforcement officers who are involved with noise control but on a limited part-time basis.

TABLE V

STATE OF OKLAHOMA

Municipal Noise Ordinances
(1976)

COMMUNITY	ORDINANCE								TOTAL		
	Aircraft	Building	Construction	Nuisance	Railroad	Vehicle	Rec./Vehicle	Zoning	a	b	
Oklahoma City				b				a	1	0	2
Tulsa				b					0	1	1
TOTAL (a)	0	0	0	0	0	0	0	1	1	0	1
(b)	0	0	0	2	0	0	0	0	0	2	2
	0	0	0	2	0	0	0	1	1	2	3

KEY: a = regulation includes acoustical critieria;
b = regulation does not include acoustical criteria.

SOURCE: Sound and Vibration, December, 1976. Clifford R. Bragdon, Contributing Editor.

C. Workforce Projections

The state level program activities currently conducted on a part-time basis by Occupational and Radiological personnel will probably not increase extensively over the next three to five years according to the State Department of Health.

Increases will occur across the state in industry and on the community level. A five percent per annum growth is anticipated for the community and industry noise control personnel. The following table estimates statewide projected workforce requirements to 1982.

TABLE VI

STATE OF OKLAHOMA

Noise Control Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
State Department of Health Personnel	1	1	1	2	2	2	3%	20%
Other	20	21	22	23	24	25	**	5%
TOTAL	21	22	23	25	26	27	N/A	6%

** unavailable.

D. Training and Certification

Currently in Oklahoma there is no training or certification specifically directed to the area of environmental noise. Engineers

and scientific personnel receive workshop and seminar training at the state's universities and colleges.

As the noise field increases and interest in programs is aroused, training will become a requisite. The personnel on the local level will need training in the specifics of utilizing highly sensitive equipment.

E. Career Potential

Because the workforce in the area of noise pollution control is limited, there is little evidence that a significant number of career opportunities will develop over the next three to five years. Environmental engineers in both industry and the public sector may be assigned noise control duties. However, it is unlikely that distinct careers in noise control will develop in Oklahoma.

F. Conclusion

In view of the relatively recent development of noise pollution control as a distinct entity in the environmental control spectrum, activities, at least in Oklahoma, are rather limited in scope. As previously pointed out, further regulation and increased public awareness will result in a continued need for specialists and for program development leading to more careers. A number of upgrade and enrichment programs will also be needed as will appropriate staff for their implementation. The field is not expected to exceed a 5% per annum growth over the next two or three years. Thereafter, growth is expected to reflect a slower constant annual rate of about three percent. Noise control, however, will remain somewhat restricted in terms of staffing levels in Oklahoma.

III. PESTICIDES

A. Introduction

Pesticides personnel and practices in Oklahoma are becoming more sophisticated as increased research yields better and safer equipment and practices. Increased emphasis is being placed on education of applicators, dealers and manufacturers' agents. The number of pest control firms across the state is beginning to level off. This stabilization of the industry may be due in part to ever increasing costs involved in production of new pesticides and equipment. Under the federal legislation, some pesticides have been removed from the market.

B. Workforce Profile

The Oklahoma State Department of Agriculture, Entomology Section, Plant Industry Division has been allocated responsiblity for pesticides usage, storage sales and training and certification of applicators. The protection of the state's people from chemical overexposure is a major objective of this program.

Under the provisions of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) the state has assumed responsibility for and has submitted a Pesticide State Plan. Under the terms of this Plan, the Department of Agriculture will be designated as the state lead agency, for the training and certification of the state's commercial and private applicators.

The following table details the current staffing levels of the Oklahoma Department of Agriculture, Entomology Section, Plant Industry Division.

TABLE VII

OKLAHOMA STATE DEPARTMENT OF AGRICULTURE

Entomology Section, Plant Industry Division
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Administrator	7	0%
Entomologist	11	15%
Apiary Specialist	1	*
Dipping Vat Inspector	1	*
Contract Fumigator	1	5%
Secretarial	6	N/A
TOTAL	27	N/A

* unavailable

The following table illustrates the estimated current staffing levels of the state's commercial and private applicators. Oklahoma divides the commercial applicator category into commercial and non-commercial. The non-commercial applicator is one who uses or supervises the use of restricted-use pesticides and who is not a state commercial, or for hire applicator, or a private applicator (usually a farmer or rancher). The table following combines non-commercial with commercial, however.

TABLE VIII

STATE OF OKLAHOMA

Pesticides Personnel
Applicators
Current (1976) Staffing Level
(estimated)

Category		1976	%/annum turnover (average)
Commercial Applicators			
Agricultural Pest (includes aerial and ground)		450	15%
Agricultural Animal	20		
Forest Pest Control		20	10%
Aquatic Pest Control		25	5%
Ornamental & Turf		500	15%
Right-of-way		50	15%
Industrial, Institutional, Structural		500	*
Public Health		100	*
Regulatory		50	5%
Demonstration & Research		800	5%
Private Applicators		20,000	N/A
TOTAL		22,495	

* unavailable

C. Workforce Projections

Increases will be observed to a limited degree at the state level as well as within the ranks of the commercial applicator category. Private applicators will probably experience a gradual increase in number until the certification program is completed. Over the next decade, if changes occur within the private applicator designation, a slight decrease may be observed as farming and ranching operations are consolidated due to increased land value and operational costs.

The following tables illustrate the projected workforce requirements to 1982 for the pesticides personnel across the State of Oklahoma.

TABLE IX

OKLAHOMA STATE DEPARTMENT OF AGRICULTURE

Entomology Section, Plant Industry Division
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	7	8	8	9	9	9	0%	5%
Entomologist	11	11	12	12	13	13	5%	19%
Apiary Specialist	1	1	1	1	1	1	*	0%
Dipping Vat Inspector	1	1	1	1	1	1	*	0%
Contract Fumigator	1	0	0	0	0	0	*	-20%
Secretarial	6	6	7	7	7	7	N/A	3%
TOTAL	27	27	29	30	31	31	N/A	3%

* unavailable

TABLE X

STATE OF OKLAHOMA

Pesticides Personnel - Applicators
Workforce Projections to 1982 (est.)

Category	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Commercial Applicator	2495	2570	2647	2726	2807	2891	15%	3%
Private Applicator	20000	20000	20000	22000	23000	25000	N/A	5%
TOTAL	22495	22570	22647	24726	25807	27891	N/A	4%

The commercial applicator category illustrated above reflects a three percent per annum growth. But, within the specific categories, the Demonstration and Research applicator personnel are projected to experience a possible 20% increase over the next four years.

D. Training and Certification

On-job-training for new Department of Agriculture personnel is accomplished through reading sessions (including rules and regulations) and periods of working with experienced inspectors to familiarize the entrants with the components of the Division.

There are five or six annual in-house training sessions conducted. Agricultural/chemical industry seminars are also attended on a sporadic basis by the Division. U.S. Environmental Protection Agency seminars have not been attended on a regular basis in the past.

The Division works with industry, the State Health Department, the Extension Service of the Oklahoma State University and a variety of community group organizations to prepare applicator certification and training programs. Training for certification is conducted in cooperation with the Extension Service of Oklahoma State University.

All commercial applicators must be certified and licensed before using pesticide chemicals. By October 1977, all private applicators who use restricted-use pesticides must be certified also.

The following illustrates current training efforts in Oklahoma.

TABLE XI

STATE OF OKLAHOMA

Pesticides Training
1976

SPONSOR	LENGTH	PROGRAM	NUMBER TRAINED	NUMBER CERTIFIED
Extension Service & State Department of Agriculture (SDA)	5 sessions	Registration of pesticides; Special Problems; Data Requirements; Effective Materials	*	*
Extension Service & SDA	2 sessions	Ornamental & Turf Applicators	465	265
Extension Service & SDA	4 sessions	Agricultural Plant Applicators	340	310
Extension Service & SDA	*	Demonstration & Research	600	461

* unavailable

To date, 13,500 private applicators have been certified.

E. Career Potential

Special types of careers will become available in pesticides over the next five years in Oklahoma. More researchers will be involved in the pest management concept of insect control. Entomologists will find career availability as will commercial applicators. The commercial applicator will require increased skills and knowledges, however.

This field will continue to develop over the next few decades as a result of increasing regulations and growing diversity and complexity of the pesticides being used. Consequently, a good deal of upgrading and continued training for those already in the field will be necessary. Conversely, unless the high turnover pattern is reversed, nearly one third of the commercial applicator labor force will consist of new employees each year.

A number of disciplines which will necessitate varying technical skill competencies, as well as those which will require longer educational programs, will be needed. There will also be a need for professional level training in less specialized areas since pest control extends into the areas of water, solid waste and air. The following represents a partial listing of available options.

Pesticide Research
Equipment Maintenance
Consultant
Custom Operator
Aquatic Biologist
Botanist
Sanitary Engineer
Environmental Technologist
Technical Assistant
Research Chemist
Pest Management Specialist
Equipment Maintenance
Custom Applicator
Entomologist
Horticulturist
Sanitarian
Environmental Engineer
Research Scientist
Environmental Health &
Laboraotry Technician

As might be expected, most areas within the field will require considerable training in the sciences, although many of the skills could be acquired with shorter vocational technical courses complemented by internships, work-study and OJT programs.

F. Conclusion

After examining the pesticide control field, a number of observations appear to characterize the available information. It is

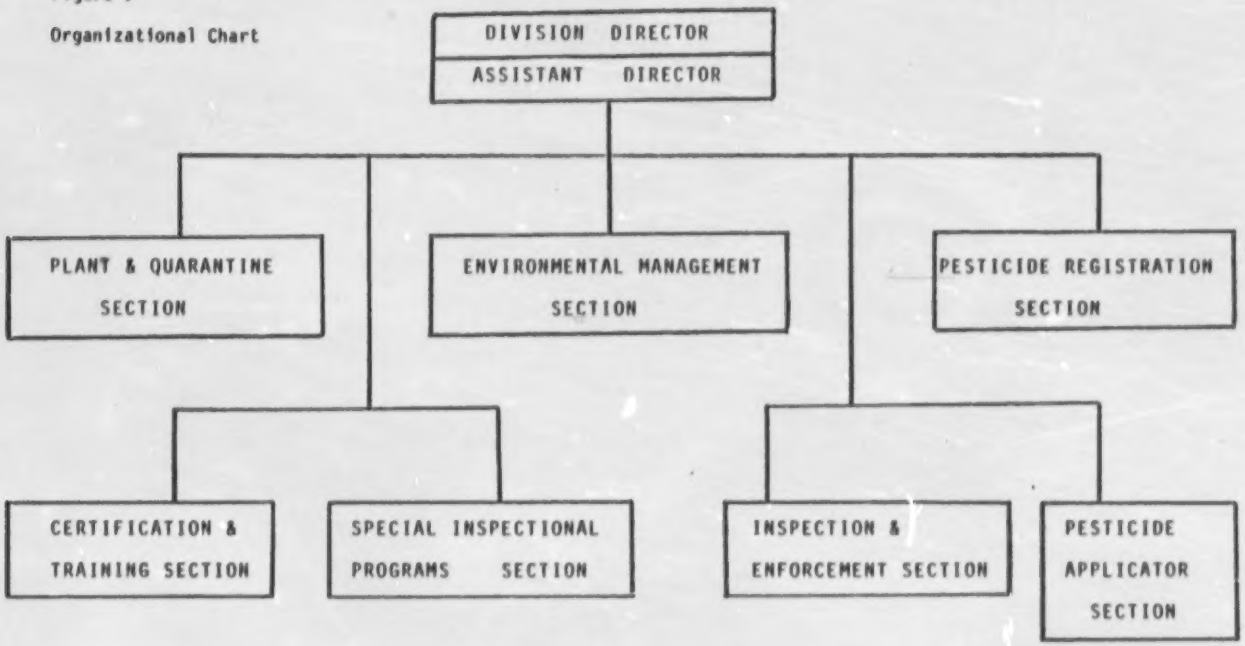
difficult to determine specifically what disciplines will offer the greatest career potential as new technology, shifting demographic conditions and regulatory mandates emerge, though careers which appear likely to play an important role in pest control in Oklahoma are in Integrated Pest Management (IPM). It utilizes any number of methods, e.g., sterilization, pathogens, chemicals, to control specific pest problems. Many of the previous careers outlined in career potential section would dovetail into the Pest Management schematic at a variety of levels depending on the individual's interest. Certainly IPM will not be the solution to the difficulties confronting the field of pesticides/pest control, but appears that IPM will be a major component of the Oklahoma future program.

OKLAHOMA STATE DEPARTMENT OF AGRICULTURE

ENTOMOLOGY SECTION, PLANT INDUSTRY DIVISION

Figure 9

Organizational Chart



IV. POTABLE WATER

A. Introduction

The State of Oklahoma has indicated intentions of assuming primary enforcement responsibilities of the Safe Drinking Water Act, P.L. 92-523. There is every indication that the state not only will assume "primacy" but will be one of the first states in the country to accomplish this.

Overall the quality of Oklahoma drinking water is considered to be good. An extensive program of monitoring, surveillance, technical assistance and planning is currently ongoing across the state. The major problem related to drinking water in Oklahoma is availability of supplies. Oklahoma is a water poor state.

The Oklahoma Department of Health, Environmental Health Services, Water Quality Service has been designated as the agency with primary responsibility for drinking water in the state.

B. Workforce Profile

The Water Quality Service is divided into three major components. These divisions are responsible for drinking water as well as for waste water. Differentiation of personnel into the two specific categories is not easily accomplished by the Department. However, the following is an attempt to assign the staff to these two environmental control areas of potable water and waste water. Staffing figures are estimated, therefore. The entire Water Quality Service personnel profile may be obtained by combining the table below with Table XXVIII, "Current (1976) Staffing Levels" appearing in Section VII entitled "Waste Water."

TABLE XII

OKLAHOMA STATE DEPARTMENT OF HEALTH

Environmental Health Services
Water Quality Service
Potable Water Personnel
Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Administrator	2	0%
Engineer	6	12%
Engineer Aide	1	10%
Environmental Program Specialist	4	10%
Sanitarian	5	10%
Chemist	3	8%
Environmental Scientist	1	10%
Biologist	1	8%
Secretarial	3	N/A
TOTAL	26	N/A

Responsibilities involving the public water supply program include the following:

° Engineering and technical assistance;

° Plan review;

° Laboratory certification;

° Training and certification;

° Enforcement;

° Data Management;

° Disease surveillance; and,

° Swimming pools.

Responsibilities also include surveillance of some 1,050 public water supplies that serve over 2,250,000 residents of Oklahoma. All

of these systems are required to submit monthly bacteriological records and monthly operational reports to the Department. Technical assistance is available for water systems with operational and/or maintenance problems. Citizen complaints concerning drinking water are investigated by either state or county health department personnel.

Currently there are approximately 1,709 certified operators in the state. There are approximately 400 operators who are not, as yet, certified. Other water personnel are predominantly water maintenance, laboratory personnel, meter installers and line repairmen. The table below details the estimated workforce statewide.

TABLE XIII

STATE OF OKLAHOMA

Potable Water Personnel
Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Class A Operator*	409	12%
Class B Operator*	600	15%
Class C Operator*	700	20%
Uncertified Operator***	400	45%
Other	400	**
TOTAL	2,509	N/A

* Certified;
** Unavailable
*** Includes Helpers

It should be noted that although the total number of certified operators is 1,709, the distribution of these operators among the three classifications is an estimation. Class A is the highest permanent certification and Class C is the lowest.

C. Workforce Projections

Due to the strong possibility of the state's assuming primary enforcement responsibility under the Safe Drinking Water Act, increases in the staff are anticipated over the next two years. At that time, few staff increases are anticipated for the subsequent two to four years.

The following table depicts anticipated growth as estimated by state personnel.

TABLE XIV

OKLAHOMA DEPARTMENT OF HEALTH

Environmental Health Services
Water Quality Service
Potable Water Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	2	2	2	2	2	2	0%	0%
Engineer	6	6	8	8	8	8	12%	7%
Engineer Aide	1	1	2	2	2	2	10%	20%
Environmental Program Specialist	4	5	6	6	6	6	10%	9%
Sanitarian	5	5	5	5	5	5	10%	0%
Chemist	3	4	5	5	5	5	8%	12%
Environmental Scientist	1	1	1	1	1	1	10%	0%
Biologist	1	1	1	1	1	1	8%	0%
Secretarial	3	4	5	5	5	5	N/A	12%
TOTAL	26	29	35	35	35	35	N/A	7%

Growth should occur in operating personnel at approximately three to five percent per annum to 1982. The estimated anticipated workforce requirements for the next five years are depicted in the table following.

TABLE XV

STATE OF OKLAHOMA

Potable Water Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Class A Operator*	409	421	434	447	460	474	12%	3%
Class B Operator*	600	624	649	675	702	730	15%	4%
Class C Operator*	700	735	772	811	851	894	20%	5%
Unclassified Operator	400	408	416	424	432	449	45%	2%
Other	400	408	416	424	432	449	**	2%
TOTAL	2509	2596	2687	2781	2877	2996	N/A	4%

* Certified;
** Unavailable.

D. Training and Certification

The training and certification program is conducted by the Water Quality Service and includes training of water system operators, in-house staff training and presentation of public water supply information to interested groups. Most approved training sessions are conducted by the State Health Department throughout Oklahoma. Approximately 80 daytime training meetings are held each fiscal year. In addition, the Oklahoma Rural Water Association also conducts about 20 daytime classes per year. Night classes are now available in most area vocational technical schools. Additionally, Oscar Rose Junior College in Midwest City is developing a specialized program in water and waste water operations.

The Oklahoma law requires the person who is in charge of the water treatment or distribution plant to be certified. Helpers need not be certified but the certified supervisory person must be present whenever the helper is working.

Certification classification is determined under three categories. A Superintendent or the person in charge must hold permanent certification at the time he is hired if the waterworks serve a population in excess of 3,000. Superintendent's taking a position in a plant serving less than 3,000 in population may hold a temporary certification during the first year.

Operators who are not supervisors or superintendents may hold any class of certificate. The following describes the classification of water works in Oklahoma.

TABLE XVI

STATE OF OKLAHOMA

Water Works Classifications

Class	Type of Facility	Population
A	Water Filtration and/or Softening Works	20,000 or more
B	Water Filtration and/or Softening Works	Up to 20,000
C	Well water works and any works not designated in other two classifications	Up to 10,000

The certification classifications in Oklahoma carry educational and experiential requirements. The table following details these requirements.

TABLE XVII

STATE OF OKLAHOMA

Educational & Experiential Requirements
For Certification

Class	Requirements	
	Experiential	Educational
C	None	4 days
B	3 years	8 days
A	8 years	12 days

The state recommends study materials to those persons interested in becoming certified. These materials include:

- Manual of Instruction for Water Treatment Plant Operators (commonly called the New York manual);
- Texas Water Works Manuals which include:

  "Water Works Operation" I
  "Water Works Operation" II
  "Ground Water Supply" III
  "Surface Production" IV
  "Water Distribution" V

- "Standards for Public Water Supply Facilities" (commonly called Oklahoma Water Standards);
- "Simplified Procedures for Water Examination" (AWWA).

Once each year the Water Pollution Control Association conducts a three-day annual short school and business meeting. Types of sessions included for drinking water personnel include:

- Water wells;
- Intermediate Water Processing;
- Special Topics;

° Maintenance of Water Systems;

° Bacteriology & Testing;

° Basic Water; and,

° Laboratory Training.

The examination for certification is administered upon completion of the school.

E. Career Potential

Public water career opportunities are projected to be available, but job options will require increased technical skill levels. The following list of occupations suggests some employment possibilities at either the vocational/technical level or at the degreed level:

Engineer (mechanical; civil; chemical; environmental)
Bacteriologist
Electrician
Plant Inspector
Plant Operator
Engineering Aide
Chemist
Systems Analyst
Well/Pump Mechanic
Maintenance/Repair

The foregoing suggests that the public water field is and will undergo a number of adjustments and changes during the next few years which will impact the employment picture.

F. Conclusion

New treatment methods, changing technologies and shifting demographic trends will occasion development of unique and increased levels of skills. There is a continuing need for formal training programs to meet existing conditions. Full-time instructors capable of teaching advanced programs are needed to relieve the present teaching burden.

In all, the field should grow over the next few years, at the rate of at least five to seven percent per annum. If a sound professional core of personnel continues to develop, it may be the basis for attractive, though lesser skilled supportive positions. In addition to actual plant operation, research and development activities may well become one of the most promising fields in the future. Laboratory, data processing, and secretarial personnel will also be increasingly required when the state assumes primary enforcement responsibility.

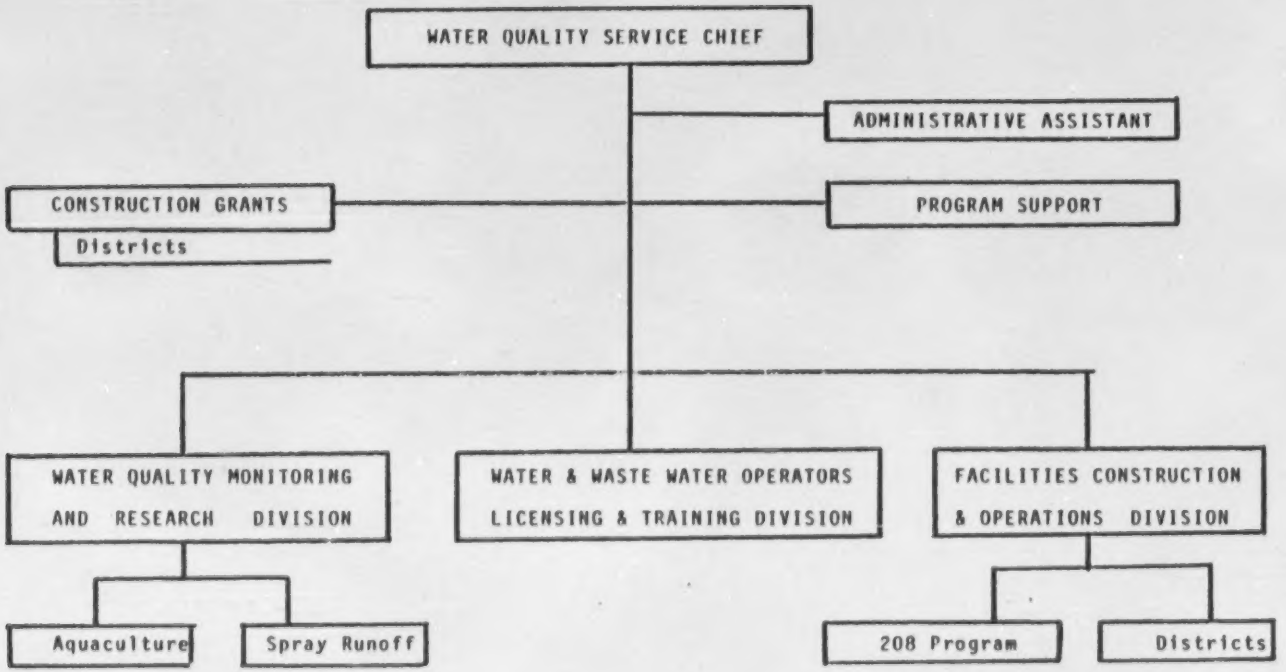
NOTE: The state of Oklahoma assumed primary enforcement responsibility under the Safe Drinking Water Act on April 29, 1977. Subsequently, the EPA stated that the projected workforce figures (see Table XIV) appear to be too low based on EPA projected workloads.

OKLAHOMA STATE DEPARTMENT OF HEALTH

ENVIRONMENTAL HEALTH SERVICES

WATER QUALITY SERVICE

Figure 10 Organizational Chart



V. RADIATION

A. Introduction

The use of radiation and radioactive materials is increasing in Oklahoma. To date, however, there is no nuclear power plant located within the state. Nuclear energy will come to Oklahoma later than to many neighboring states. The first nuclear power plant is scheduled for operation in 1982.

Radiation control is a definite area of concern expressed by Oklahoma citizens. The state is not an "agreement" state, as yet. This term refers to an agreement between the state and the Nuclear Regulatory Commission (NRC) in which the state assumes some of the responsibilities of the Commission.

Although the state has not assumed agreement status and does not as yet have a nuclear power plant, other activities involving the use of radiation and radioactive materials are present across the state to varying degrees. The following table presents an overview of radiation uses within the state.

TABLE XVIII

STATE OF OKLAHOMA

Uses of Radiation & Radioactive Materials

Use	Number (estimated)
Total Number of Particle Accelerator Users	11

TABLE XVIII

(continued)

Use			Number (Estimated)
Dental X-Ray			
Total Machines			1,470
Machines Registered		1,470	
Machines In Compliance [1]		1,048	
Medical X-Ray [1]			
Total Machines			1,790
Diagnostic		1,744	
Hospital	479		
Clinic	322		
X-Ray Truck	-0-		
Physicians	609		
Chiropractors	194		
Veterinarians	100		
Podiatrists	40		
Therapeutic		46	
Total Registered		1,790	
Total Inspected [2]		1,083	
Total In Compliance		985	
Non-Healing Arts X-Ray [1]			
Facilities			60
Radiographic/ Fluoroscopic Devices		60	
Analytical X-Ray Devices		26	
Total Registered		60	
Total Inspected		60	
Total In Compliance		*	
By product, source, & Special Nuclear Materials [3]			213
Total Radium - Radon [1]			
Facilities			45
Medical		18	
Industrial		27	

[1] Regulatory Program; [2] Fiscal Year 1975;
[3] NRC licenses in state;
* no Program.

SOURCE: HEW Publication (FDA) 77-8005; Report of State & Local Radiological Programs, October, 1976.

The table above depicts 3,589 sources of radiation used across the state. Users of these sources include industrial, medical, governmental and educational institutions and agencies. The users employ several applications of these radiation sources: research and development; industrial radiography; well logging; and, medical diagnosis and therapy.

B. Workforce Profile

The Oklahoma statutes, Sections 1-1502 to 1-1510, define the responsibility for the protection of the citizenry and the environment in radiation control. This responsibility has been delegated to the Oklahoma Department of Health, Environmental Health Service, Occupational & Radiological Health Service, Radiation Protection Division. An organizational chart is presented in the following pages.

The Radiation Protection Division is composed of three sections:

- X-ray Section;
- Environmental Surveillance Section; and,
- Radioactive Materials and Non-Ionizing Section.

In conjunction with the Division, a radiological health laboratory is responsible for contributing assistance to several national surveillance systems. The laboratory also conducts measurements and analyses of radioactive materials in milk, drinking water and air.

The following table depicts the current staffing levels of the Radiation Protection Division. Information relative to the current and projected workforce profiles was obtained through on-site and telephone interviews.

TABLE XIX

OKLAHOMA STATE DEPARTMENT OF HEALTH

Occupational and Radiological Health Services
Radiation Protection Division
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Division Director	1	0%
Engineer	1	2%
Environmental Health Specialist	3	3%
Sanitarian	3	6%
Chemist*	1	3%
Biologist*	1	3%
Environmental Engineer	1	3%
Secretarial	2	N/A
TOTAL	13	N/A

* Laboratory personnel.

The Division is responsible for the radiation control program. The Division staff conducts activities and executes legally defined responsibilities through means of the following:

- Maintain and operate a control system for radioactive materials usage, registration, inspection, and enforcement activities are utilized;
- Surveillance of non-ionizing radiation such as lasers and microwave;
- Administer, review and evaluate radiation regulations;
- Maintain computer program;
- Provide laboratory services; and,
- Conduct surveillance program of water supplies, surface and ground water, air and food.

The Division also conducts the emergency response program. This involves immediate response to emergencies or incidents involving sources of radiation and other hazardous substances. This program also includes responding to emergencies involving radioactive materials and the coordination of reaction plans with other state agencies.

The radiation control personnel, both public and private sectors, are depicted in the following table.

TABLE XX

STATE OF OKLAHOMA

Radiation Control Personnel
Public & Private Sector
Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Local Sanitarian, Civil Defense Personnel	360	*
Medical/Dental X-Ray and other personnel	640	*
TOTAL	1000	N/A

* unavailable

C. Workforce Projections

The Radiation Protection Division has doubled in staff number over the last two years. There are few changes indicated for this workforce over the next three to five years. The table following, however, indicates projected workforce requirements to 1982 for the Division.

TABLE XXI

OKLAHOMA STATE DEPARTMENT OF HEALTH

Occupational & Radiological Health Services
Radiation Protection Division
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Division Director	1	1	1	1	1	1	0%	0%
Engineer	1	1	1	2	2	2	2%	20%
Environmental Health Specialist	3	3	3	4	4	4	3%	7%
Sanitarian	3	3	3	3	3	3	6%	0%
Chemist*	1	1	1	1	1	1	3%	0%
Biologist*	1	1	1	1	1	1	3%	0%
Environmental Engineer	1	1	1	1	1	1	3%	0%
Secretarial	2	2	2	3	3	3	N/A	10%
TOTAL	13	13	13	16	16	16	N/A	5%

* Laboratory personnel.

Growth will occur in the private sector and at the local level. The following tables estimates this anticipated growth for each category to 1982.

TABLE XXII

STATE OF OKLAHOMA

Radiation Control Personnel
Public & Private Sector
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Local Personnel	360	371	382	393	405	417	*	3%
Private Sector Personnel	640	672	706	741	778	807	*	5%
TOTAL	1000	1043	1088	1134	1183	1224	N/A	4%

* unavailable

D. Training and Certification

With the dramatic staff increases (100% over two years) during recent years the Division was inclined to conduct training in-house, of a rather intensive nature. Reading was assigned and experts in the radiation control field were invited to lecture. When the new employees completed this training, evaluation revealed that the efforts were similar to a Master's Degree in the university.

The U.S. Environmental Protection Agency (EPA) conducts four to six short courses per annum. A number of Division personnel participate in these courses, as well as those sponsored by the Food & Drug Administration (FDA) and the Regional Training Committee.

The Nuclear Regulatory Commission conducts extensive training at the Oak Ridge University in Tennessee. Personnel are allowed to attend these courses on a select basis due to constraints of time and dollars.

It has been estimated that less than 50% of the total radiation personnel across the state have received training of some description. The majority of persons working in the radiation control field, therefore, have received no training.

E. Career Potential

Career opportunities should be available in the field of radiation control in Oklahoma over the next three to five years. Highly skilled, degreed level (and higher) personnel in the sciences should

be in demand to 1982. As radiation activities proliferate across the state, the required workforce will also increase.

F. Conclusion

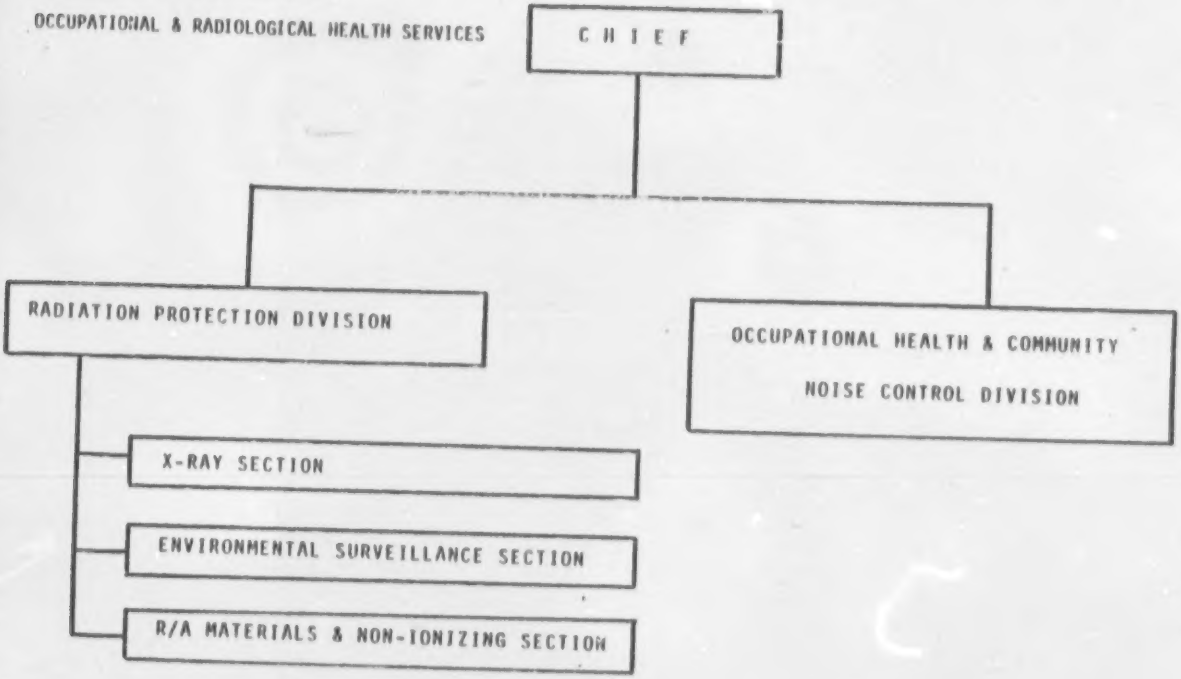
The use of radiation and radioactive materials is increasing in Oklahoma. Consequently, the workforce equipped with the requisite skills should experience growth in career options. The types of occupations will tend to change as the statewide usage and user profile changes. Should Oklahoma become an agreement state, further increases in occupational areas of opportunity should occur.

OKLAHOMA STATE DEPARTMENT OF HEALTH

ENVIRONMENTAL HEALTH SERVICES

OCCUPATIONAL & RADIOLOGICAL HEALTH SERVICES

Figure 11 Organizational Chart



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VI. SOLID WASTE

A. Introduction

According to Oklahoma state law, all incorporated cities shall adequately provide for the disposal of solid wastes generated or existing within the incorporated limits. There are presently 641 incorporated communities in Oklahoma. The following table details the compliance status of the cities and towns of the state. The state considers compliance standards to have been achieved when an incorporated city or town is utilizing an approved disposal facility or a permitted sanitary landfill.

TABLE XXIII

OKLAHOMA INCORPORATED COMMUNITIES

Solid Waste Compliance Status

Population	Total Number of Communities	Communities in Compliance
10,000 or above	29	29
5,000 - 10,000	27	26
3,000 - 5,000	25	16
Less than 3,000	480	216

By examination of the table above, it may be seen that 51% of the incorporated communities of the state presently are considered to be in compliance. Unincorporated areas of the state are not addressed by the Oklahoma Solid Waste Management Act. Since there is no method of

collecting fees from rural residents, the development of a solid waste management system must be on a voluntary basis.

Currently the state personnel consider the lack of legislative authority over unincorporated communities to be a weakness of the Act. Another problem area is the present lack of hazardous waste legislation.

Probably the major hindrance to the overall program of solid waste management in Oklahoma, is the increasing disdain on the part of the citizenry for governmental agencies and governmental regulations. This attitude of antagonism on the part of the public does not lend strength to the overall endeavors of the state program personnel.

Increased efforts relative to educating the public regarding solid waste management practices as well as dangers, is a vital component of the program statewide which is strongly recommended and recognized as a need on the part of state personnel. Of increasing concern is the attitude regarding hazardous wastes. The public appears to view hazardous waste disposal sites as a degradation of the environment rather than as efforts directed at protection not only of the environment but of the citizens as well.

B. Workforce Profile

Legislative authority has designated the Oklahoma Department of Health, Environmental Health Services, Sanitation Service, Solid Waste Management Division as the lead state agency regarding solid waste management. Hazardous wastes also come under the aegis of the Solid

Waste Management Division. The equivalent of two Sanitarians (person years) are indicated on the table below as this supporting field personnel. The Attorney General's office provides the legal assistance requested by the Division.

The following table illustrates the current staffing levels of the Department of Health solid waste program personnel.

TABLE XXIV

OKLAHOMA STATE DEPARTMENT OF HEALTH

Environmental Health Services
Solid Waste Management Division
Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Director	1	0%
Environmental Program Specialist	3	0%
Environmental Consultant (Legal)	1	0%
Geologist	1	0%
Sanitarian	1	0%
Sanitarian*	2	5%
Secretarial	3	N/A
TOTAL	12	N/A

* Sanitation & Plumbing Division.

The major responsibilities of the Solid Waste Management Division include the following:

° Regulation of land disposal sites;

° Enforcement;

° Complaint Investigation;

° Technical Assistance;

° Hazardous Waste Management; and,

° Regulations and legislation.

Although firm figures for the statewide personnel are difficult to develop the table below presents an estimated workforce profile. Of the sanitary landfills located across the state, 69% are public and 31% are private.

TABLE XXV

STATE OF OKLAHOMA

Solid Waste Management Personnel
Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Landfill Operator	300	15%
Collector	1,000	15%
Other*	75	15%
TOTAL	1,375	15%

* Private sector personnel

C. Workforce Projections

Increased numbers of landfill operators, collectors and professional personnel are anticipated for the state level program and across Oklahoma. The private sector workforce may see added growth as the present reputation of reliability is established.

The following tables detail the anticipated workforce requirements to 1982. Information regarding projected workforce profiles as well as current staffing levels was obtained by means of on-site interviews and telephone conversations with state personnel.

TABLE XVI

OKLAHOMA STATE DEPARTMENT OF HEALTH

Environmental Health Services
Sanitation Service
Solid Waste Management Division
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Director	1	1	1	1	1	1	0%	0%
Environmental Program Specialist	3	3	4	6	6	6	0%	17%
Environmental Consultant (Legal)	1	1	2	2	2	2	0%	20%
Geologist	1	1	2	2	2	2	0%	20%
Sanitarian*	3	3	3	5	6	6	5%	17%
Secretarial	3	3	4	5	5	5	N/A	12%
TOTAL	12	12	16	21	22	22	N/A	14%

* Includes Sanitation & Plumbing Division personnel.

State Department of Health personnel anticipate that the Solid Waste Management Division staff will experience almost a 100% increase in staff over the next three to four years in order to facilitate the added workload of the impending federal legislation.

TABLE XXVII

STATE OF OKLAHOMA
Solid Waste Management Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Lanfilll Operator	300	315	331	348	365	383	15%	5%
Collector	1000	1030	1061	1093	1106	1139	15%	3%
Other*	75	79	82	85	88	92	15%	4%
TOTAL	1375	1424	1474	1526	1559	1614	15%	4%

* Private Sector Personnel

D. Training and Certification

There is very little training currently ongoing in the Division. All personnel have had solid waste field experience.

EPA seminars are frequently attended by the Division in order to obtain upgrade training in operations, disposal, and construction. Division personnel are encouraged to return to school for advanced degree training.

No certification is required for landfill operators in Oklahoma. Training on the local levels is not extensive. Certification of operating personnel would contribute to the safety of these persons. Solid waste management currently maintains the highest occupational accident statistics. Certification as a result of proficient training would benefit the operators as well as the supervisory and managerial personnel. Certification is not viewed as a near future condition, however.

E. Career Potential

There are a number of fields requiring various levels of skill/professional training which may develop in the future as a consequence of more stringent control/enforcement. The following job designations represent those positions specifically related to solid waste control practices. The listing assumes that landfill sites will increase in size as well as in number and that collection activities will increase, thereby impacting the diversity of tasks performed at the sites.

The following occupations should be available across the state to 1982. Increased educational efforts regarding the public's attitude

towards the hazards of poor solid waste management will also impact the availability of careers. However, the following listing is presented as representative of future occupational opportunities.

Superintendent of Solid Waste
Engineering Technician
Garbage Collector
Solid Waste Management Assistant
Heavy Truck Operator
Incinerator Operator
Landfill Disposal Assistant (Material Handler)
Engineer Aid (Helper)
Garbage Collection Foreman
Scale Man (Weighmaster)
Surveying Technician
Heavy Equipment Operator
Incinerator Plant Foreman
Incinerator Plant Attendant
Landfill Foreman

F. Conclusion

After examining the Oklahoma solid waste management field, a number of conclusions may be drawn which generally characterize the situation at present, and which may have implications for employment and training. Most significantly, increasing emphasis given to resource recovery and energy conversion will play an important role in determining employment levels and training program. Such activities, as they relate to solid waste management will be in the technical fields: chemistry; hazardous waste management; engineering; metallurgy; complex machine operation and maintenance; and, materials handling. While certain fields may require degreed training, a fair amount of such training may be accomplished at vocational technical institutes or community colleges. Solid waste management programs such as those already begun under the aegis of the federal government will become increasingly important as landfill operations become more diversified and complex. Future regulations, both at the state and federal level,

will require the training and possibly the certification of all Oklahoma sanitary landfill owners and operators as well as additional training for those entering the field. Further, as the complexity of solid waste pollution control activities increases, qualified personnel will be needed to instruct in the aforementioned technical fields. Also, it may be assumed that the field will continue to grow and develop; and, therefore, there will be a growing need for systems analysts in finance, production and administration. Finally, there will be a continuing need (though little growth is anticipated) for professionally trained individuals in sanitary or environmental engineering to complement physical and natural scientists trained in fields emphasizing the environmental pollution control disciplines.

VII. WASTE WATER

A. Introduction

Oklahoma has a wide range of water quality problems. Major contributors to the state's water pollution are the following:

- Effluents from municipal and industrial waste treatment facilities;
- Agricultural runoff;
- Runoff from urban areas;
- Mine drainage;
- Leeching from mineral deposits;
- Salt water from oil wells which currently number approximately 80,000 (producing); and,
- Siltation from construction activities.

The major legislation under which the state conducts the waste water program is the Federal Water Pollution Control Act, P.L. 92-500. Under the 1972 Amendments to this law the National Pollutant Discharge Elimination System (NPDES), permitting of dischargers to ensure effluent limits has become a major component of the Oklahoma program.

B. Workforce Profile

Under the Oklahoma statutes, the Department of Health, Environmental Health Services, Water Quality Service has been designated as the responsible agency with regard to water pollution control and abatement in Oklahoma.

The Water Quality Division is composed of three divisions. These include:

- Facilities Construction & Operations;

° Water Quality Monitoring and Research; and,

° Water and Waste Water Licensing and Training.

As mentioned in Section IV entitled "Potable Water" the Oklahoma Department of Health does not differentiate between water and waste water in terms of staffing assignments. Therefore, a clear cut division of personnel between the two areas is difficult. The following table is an effort to accomplish such a division.

TABLE XXVIII

OKLAHOMA STATE DEPARTMENT OF HEALTH

Environmental Health Services
Water Quality Service
Waste Water Personnel
Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Administrator	2	0%
Engineer	10	12%
Environmental Aide	1	10%
Environmental Program Specialist	8	10%
Sanitarian	10	10%
Chemist	1	8%
Limnologist	3	8%
Environmental Scientist	1	10%
Microbiologist	1	8%
Biologist	4	8%
Planner	1	N/A
Secretarial	4	N/A
TOTAL	46	N/A

Information regarding current and projected workforce profiles was obtained by means of on-site interviews with state personnel. For a complete description of the Water Quality Service, the preceding table may be combined with the Table XII, "Current (1976 Staffing Levels," illustrated in Section IV, "Potable Water."

The responsibilities of the Facilities and Construction Operations Division, relative to waste water, include the following:

- Review of plans and specifications for water pollution control facilities and sewer line extensions prior to permitting;
- Final inspection of facilities;
- Evaluation at least once each fiscal year of existing facilities;
- Administration of Construction Grants Program under the Federal Water Pollution Control Act, P.L. 92-500;
- Evaluation of industrial discharges; and,
- Provide technical assistance to municipalities.

The Water Quality Monitoring and Research Division is responsible for waste water training, research and monitoring activities which include:

- Analytical evaluation of waste water treatment facilities;
- Investigation of complaints such as fish kills;
- Laboratory training of waste water treatment plant operators;
- Applied research regarding treatment techniques for sewage facilities, and reclamation and reuse of waste water;
- Environmental quality control programs efforts;
- Data processing; and,
- Statewide monitoring and surveillance program.

The third division of the Water Quality Service, the Water & Waste Water Operators Licensing and Training Division, offers basic and upgrade training to treatment plant operators. A more comprehensive statement of these activities may be found in Section D, "Training and Certification."

Currently in Oklahoma, there are approximately 500 to 600 waste water treatment plants. The total number of certified operators has been estimated at 1,241, while there are approximately 600 uncertified operators, mostly Helpers. There may, in addition, be another 200 persons occupationally associated with the waste water field in Oklahoma.

The following table details this statewide workforce.

TABLE XXIX

STATE OF OKLAHOMA

Waste Water Personnel
Current (1976) Staffing Level
(estimated)

Position	1976	%/annum turnover (average)
Class A Operator*	241	15%
Class B Operator*	400	15%
Class C Operator*	600	25%
Uncertified Operator***	600	45%
Other	200	**
TOTAL	2,041	N/A

* Certified;
** Unavailable;
*** Includes Helpers.

Although the total number of certified operators has been estimated at 1,241, the distribution of these operators among the three classification categories is an estimation. Class A is the highest classification, Class C the lowest.

C. Workforce Projections

The Water Quality Service is anticipated to experience an estimated five percent per annum increase for the next year and subsequently should illustrate an estimated three percent per annum growth to 1982.

The table below presents the estimated projected workforce requirements to 1982 for the waste water personnel of the Water Quality Service.

TABLE XXX

OKLAHOMA STATE DEPARTMENT OF HEALTH

Environmental Health Services
Water Quality Service
Waste Water Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administrator	2	2	2	2	2	2	0%	0%
Engineer	10	11	11	12	12	12	12%	4%
Environmental Aide	1	1	1	1	1	1	10%	0%
Environmental Program Specialist	8	9	9	10	10	10	10%	5%
Sanitarian	10	10	11	11	12	12	10%	4%
Chemist	1	1	1	1	1	1	8%	0%
Limnologist	3	3	3	3	3	3	8%	0%
Environmental Scientist	1	1	1	1	1	1	10%	0%
Microbiologist	1	1	2	2	2	2	8%	20%
Biologist	4	4	4	4	4	4	8%	0%
Planner	1	1	2	2	2	2	N/A	20%
Secretarial	4	4	5	5	6	6	N/A	9%
TOTAL	46	48	52	54	56	56	N/A	5%

Approximately a three percent to five percent per annum growth may be anticipated for the waste water treatment plant personnel, statewide. The table following depicts the anticipated personnel requirements for this segment of the workforce to 1982.

TABLE XXXI

STATE OF OKLAHOMA

Waste Water Personnel
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Class A Operator*	241	251	261	271	282	282	15%	4%
Class B Operator*	400	416	433	450	468	468	15%	4%
Class C Operator*	600	630	661	694	708	722	25%	4%
Uncertified Operator***	600	618	637	656	656	656	45%	2%
Other	200	208	216	225	234	343	**	4%
TOTAL	2041	2123	2208	2296	2348	2471	N/A	4%

* Certified;
** Unavailable;
*** Includes Helpers

D. Training and Certification

Training and certification is conducted by the Water and Waste Water Operators Licensing and Training Division of the Water Quality Service. Often the two types of personnel are trained cooperatively. The Division is involved in the following types of activities pertinent to its responsibilities:

° Conduct basic and upgrade training of treatment plant operators;

° Offer specialized training on-site in operations and maintenance;

° Keep records of training and certification of operators;

- Lend technical assistance and training to community personnel;
- Conduct in-house programs for state and county personnel;
- Enforce Certification Act;
- Coordinate training activities with other state agencies and provide reciprocity to out-of-state certified persons; and,
- Assist in preparation of training reports.

The Oklahoma law requires the person in responsible charge to be certified. The assistants and helper personnel do not have to be certified but may not work unsupervised.

The classification of certification is determined within three categories. A Superintendent or the person in supervisory charge must hold permanent certification at the time he is hired if the waste water treatment plant serves a population in excess of 3,000. Superintendents taking a position in plants serving less than 3,000 in population may hold temporary certificates for one year. At the end of that time they must be able to be certified permanently at one higher level.

Operators who are not supervisors may hold any classification of certification. The following table describes the waste water certification classification.

TABLE XXXII

STATE OF OKLAHOMA

Waste Water Treatment Plant Classification
(Sewage Works)

Class	Type of Facility	Population
A	All complete sewage works, both primary and secondary treatment plus additional when needed.	20,000 or more

TABLE XXXII

(continued)

Class	Type of Facility	Population
B	All complete sewage works	Up to 20,000
C	All complete sewage works and those not specified in Class A or B	Less than 3,000

As mentioned in Section IV, "Potable Water", Oklahoma certification includes educational and experiential requirements. These requirements are the same for water and waste water operators.

The state training staff have recommended training materials for participants. Included in these materials are the following:

- "Manual of Instruction for Sewage Treatment Plant Operators" (commonly referred to as the New York Manual);
- "Texas Sewage Works Manuals" including:
  - "Sewage Works Operation" I;
  - "Sewage Treatment" II;
  - "The Sewage System" III;
- "Standards for Water Pollution Control Facilities" (commonly called Oklahoma Standards);
- "Operation of Waste Water Treatment Plants" (commonly called the California Manual).

Training for certification examination and renewal takes many forms. One day meetings are training sessions. The area vocational technical schools are adding waste water technology courses and most may be taken during evening hours.

The Oklahoma Water and Pollution Control Association holds an annual three day short school and meeting. Water and waste water courses are offered and participants are invited to take the examination upon completion of this training.

E. Career Potential

There are a number of skill areas and degreed positions which are presently accessible to those entering the waste water field. Increased automation will certainly have its effect on employment, but all indications point to an expansion of the waste water control field. Some areas requiring less than degree training are as follows: certified operation, electricians, mechanics, equipment operators, clerical, computer programming, technical assistants (control, design, instrumentation), buildings and grounds personnel, foreman, and, laboratory technicians.

In the professional, usually degreed areas, there will be a continuing but gradual expansion of workforce requirements for individuals specializing in sciences and engineering such as the following: chemists, engineers (mechanical, electrical, sanitary, civil), systems analysts, and administrative personnel.

F. Conclusion

The potential for careers in the field will depend to a large extent on fiscal commitment to future needs and to regulations which will establish more stringent standards for treatment and operators.

State statutes presently are considered by some to be too lenient. As technology increases and advances are made in treatment plant operations, increased skill and knowledge levels will be required of the operating personnel.

VIII. ENERGY

A. Introduction

Oklahoma ranks third among all U.S. states as an energy producer. But to offset this, the state is a major consumer of those energy products currently in short supply. At present, the state produces more oil and gas than it consumes. But the question of how long the state may continue to be an exporter is of growing concern. It has been estimated that the energy usage in the state will more than triple the demands of today.

An increasing concern to the citizens and to the officials of the state is the relative incompatibility of the production and use of energy on one hand, and the protection of the state's environment on the other. This question is being addressed in a most earnest fashion by the state.

The environmental laws regulating oil and gas exploration and production have been strengthened and compliance status has improved. The state has had environmental protection laws since the earliest days of energy resource development.

Adding to the environmental concerns surrounding the state's production of energy are the proposed projects which are planned for Oklahoma's future. According to the Bureau of Mines publication #8719, Projects to Expand Fuel Sources in Western States, May, 1976, the following projects are planned for the state: seven coal mines,

10 to 12 electric power plants, one oil refinery, and three natural gas processing plants. These projects may be seen on the map on the following page. It may be added that all the coal mines proposed for Oklahoma are underground mines and do not involve stripping or surface mining. Currently, there are strip mine activities throughout the state. There are some who believe that the state requires more stringent reclamation laws.

B. Workforce Profile

There are two agencies which have been allocated energy related responsibilities in Oklahoma. These agencies are the Governor's Advisory Council on Energy and the Oklahoma Department of Energy.

The Governor's Advisory Council on Energy is a committee of approximately 20 to 25 persons appointed by the Governor to develop public policy with respect to energy production, distribution and usage in the state. The committee membership consists of industry, government, legal and utilities personnel.

The Oklahoma Department of Energy has been created by the legislature to fulfill the following responsibilities:

- Allocation of fuel;
- Interpretation of federal guidelines;
- Implementation of rules and regulations;
- Coordination of state's data bank; and,
- Cooperation with the Governor's Advisory Council on Energy and other task force and advisory bodies.

Figure 12 FUELS RELATED PROJECTS IN OKLAHOMA.

SOURCE: Bureau of Mines Information Circular #8719, Projects to Expand Fuel Sources in Western States, U. S. Department of the Interior, May 1976.

The table below details the current staffing level of the Department of Energy. An organizational chart is presented on the following page.

TABLE XXXIII

OKLAHOMA DEPARTMENT OF ENERGY

Current (1976) Staffing Level

Position	1976	%/annum turnover (average)
Director	1	0%
Deputy Director	1	0%
Manager	1	0%
Researcher	1	0%
Data Collector	1	0%
Conservation Officer	1	0%
Secretarial	2	N/A
TOTAL	8	N/A

The number of personnel working statewide in the energy and environmental control area is not known at present.

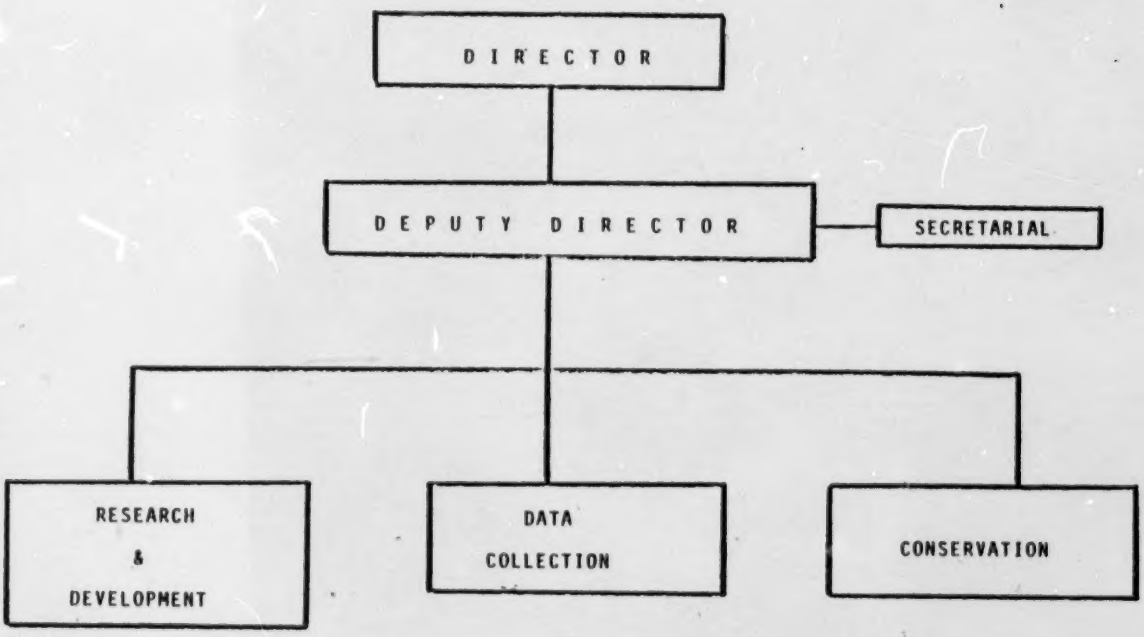
C. Workforce Projections

The Governor's Advisory Council on Energy as an advisory body may be increased or decreased at any time by the Governor. Staff projections for this committee are unrealistic.

The Oklahoma Department of Energy is not able to make firm projections at present. However, staff increases are anticipated over the next three to five years, if only on a three to four percent per annum growth rate.

OKLAHOMA STATE DEPARTMENT OF ENERGY

Figure 13 ORGANIZATIONAL CHART



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D. Training and Certification

A large number of energy related meetings where possible are attended by the staff of the Department of Energy. Specific emphasis has been placed on conservation activities. Seminars are conducted through the various councils of the state government. These seminars are focused specifically on conservation of energy. Increased public and private awareness of the needs for energy conservation are present within the framework of these seminars. Local government officials as well as state employees and the public at large are included in these efforts.

E. Career Potential

The options and availabilities of careers in the energy area will be numerous and representative of a vast range of occupations. Degreed level and higher educational requirements will define a great portion of these job categories. Engineering and scientific personnel with nuclear, coal, geothermal and solar expertise will be specific areas of knowledge that will be in demand but to a more limited degree than the more broadly based background.

F. Conclusion

The Department of Energy is currently developing the State Energy Plan which will be presented to the Governor for approval. Subsequent to that, the Plan will be submitted to the Federal Energy Administration (FEA) for approval.

Oklahoma's future growth will, to a great extent, depend largely on its ability to continue to be a major energy producter. The environmental issues which may be incompatible will need to be resolved in the near future.

Selected Post Secondary Institutions With Formal Environmental Energy Programs

Oklahoma currently has a wide range of environmental/energy related courses and programs which lead to degrees from the Associate to the Doctoral level. For the most part, however, Associate level programs are more prevalent in Oklahoma than are Bachelor or post-graduate courses and/or programs.

Oklahoma Agricultural and Mechanical College was founded in 1890 and the first graduating class consisted of six male students in the year 1896. In 1957 the College became the Oklahoma State University. Today, the University is coeducational and has an enrollment of approximately 23,300 students and offers Bachelor's degrees in more than 100 fields and advanced degrees in more than 75 fields.

OSU has several environmentally related programs and is in the process of expanding the engineering curriculum to include a Bachelor of Science degree. At present, a qualified student may be accepted into the Bioenvironmental engineering major program which leads to a Master's degree. This program is discussed further in the following pages. Also on the graduate level are the courses offered at OSU in Environmental Science which lead to a Master's or Doctor's degree.

The Technical Institute at Oklahoma City is a division of the OSU College of Engineering. Two year programs are available leading to an Associate of Science degree in Environmental Health (Civil Technology) and Environmental Safety (Fire Protection Technology). The Environmental Health curriculum is designed for students who demonstrate an interest in public health with particular emphasis in the areas of

water and air resources. The Environmental Safety curriculum is designed to prepare students for employment in industry, business and government installations where fire protection and environmental health activities are combined under one department.

The Oklahoma State System of Higher Education offers extensive courses and programs at the technical-occupational level. Among these is Environmental Engineering which may lead to an Associate degree at Cameron University, Claremore Junior College, Connors State College, and Eastern Oklahoma State College. Tulsa Junior College has developed a program in Environmental Health at the technician level. This program will be discussed in more detail in the following pages.

Oscar Rose Junior College at Midwest City, Oklahoma is a relative new-comer to the State System of Higher Education. The first classes began in 1970 and by 1973 the College had been approved by the State System. ORJC offers the Associate in Applied Science (A.A.S.) in two areas of environmental science. A general degree in environmental science is available as well as the degree with the option in wastewater technology. The same courses are taken by the students for both degrees but the second year Wastewater Technology students begin to specialize in their area.

The following pages present programs which are illustrative of environmental/energy educational offerings in Oklahoma at the post-secondary level. The information was retrieved by means of telephone interviews and catalogue review.

SENIOR INSTITUTIONS

Oklahoma State University
Stillwater, Oklahoma

Program: Bioenvironmental Engineering (M.S., Ph.D.)*

Hours required for major: Semester - 64
Staff Size: Three full professors and one assistant professor (4 with Ph.D.)
Enrollment: 40
Graduates (1976): 10
Placement: Majority are placed
Graduate Work: Not available

Courses

Biology I
Biology II
Biological Waste Treatment Design
Water Quality Management
Linear Systems
Sanitary Science
Water Treatment
Unit Operations
Solid Waste Management
Air Pollution Control
Water Resources Engineering
Hydrology
Groundwater Hydrology

*An undergraduate program in Civil Engineering (B.S. in Bioenvironmental engineering) is projected for fall 1978.

Courses now available

Introduction to Sanitary Engineering
Sanitary Engineering Design
Hydraulics

In addition, the following programs are currently available:

Environmental Science (M.S., Ph.D.)
Radiation & Nuclear Technology (B.S.)

COMMUNITY COLLEGES/TECHNICAL INSTITUTIONS

Tulsa Junior College
Tulsa, Oklahoma

Program: Radiologic Technology (A.A.S.)

Hours required for major: Semester - 77
Program Inception: 1973
Staff Size: Two instructors (2 with B.S. degree)
Enrollment: 46
Gradutes (1976): 12
Placement: 90%
Graduate Work (B.S.): 1

Courses

Introduction to Radiologic Technology
Summer Clinical Practicum
Human Anatomy & Physiology
Algebra
Orientation to Health Care
Radiologic Technology
Clinical Practice
DC Circuit Analysis
Orientation to Patient Care
Human Relations
Advanced Summer Clinical Practicum
Applied Composition
Radiologic Technology
Historical & Contemporary American Society
Applied Composition and Speech

State Legislation

TITLE:

Pollution Control Coordinating Act
Oklahoma Statutes 82-931

PURPOSE:

To establish and maintain a coordinated surveillance of the waters, air and other natural resources of the state for the purpose of controlling the quality of the environment.

DEFINITIONS:

1. Environment
2. Board
3. Director
4. Pollution
5. Waters
6. Wastes
7. Treatment works
8. Sewerage system
9. Plant
10. Source
11. Person
12. Nonpoint source

ADMINISTERING AUTHORITY:

Department of Pollution Control
Pollution Control Coordinating Board

AUTHORIZATIONS:

To coordinate all pollution control programs of the state;
To recommend other rules and regulations;
To establish a public information center;
To develop the coordinated environmental control program;
To prevent and abate pollution on its own initiative;
To conduct studies and investigations relating to environmental pollution;
To make recommendations for the combining of pollution control activities for the state.

OKLAHOMA AIR

TITLE:

Oklahoma Clean Air Act
Oklahoma Statutes 63-2001

PURPOSE:

To provide a means to achieve and maintain atmospheric purity necessary for the protection and enjoyment of human, plant or animal life in the state.

DEFINITIONS:

1. Board
2. Department
3. Commissioner
4. Council
5. Director
6. Person
7. Air pollution
8. Air contaminants

ADMINISTERING AUTHORITY:

State Department of Health
Air Quality Council

AUTHORIZATIONS:

To develop a plan for air quality management;
To conduct studies and investigations relating to air pollution;
To provide laboratory and other technical facilities;
To act as the state lead agency in air pollution matters;
To declare air pollution emergencies;
To issue regulations pursuant to the act;
To investigate complaints and enforce the act;
To grant variances under the act.

PROHIBITED ACTS:

To cause or allow air pollution in violation of established standards;
To violate other regulations issued under the act.

PENALTIES:

Fines of up to $500 or one year in jail.

OKLAHOMA NOISE

TITLE:

Noise Control Act
Oklahoma Statutes 63-1511

PURPOSE:

To provide a general program of state noise abatement and control.

DEFINITIONS:

ADMINISTERING AUTHORITY:

State Department of Health

AUTHORIZATIONS:

To conduct studies and investigations relating to noise abatement, noise measurement, health exposure effects of noise, and consumer safety effects of noise;
To act as the state lead agency in noise matters;
To cooperate with other state and federal agencies in noise abatement matters.

OKLAHOMA PESTICIDES

TITLE:

Pesticide Applicators Law
Oklahoma Statutes 2-381

PURPOSE:

To provide for the control of pesticides and their use through an applicator certification program.

DEFINITIONS:

1. Aircraft
2. Applicator
3. Board
4. Custom application of pesticides
5. Defoliant
6. Desiccant
7. Fungi
8. Fungicide
9. Ground equipment
10. Herbicide
11. Insect
12. Insecticide
13. Person
14. Pesticide
15. Weed

ADMINISTERING AUTHORITY:

Department of Agriculture

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To enter and inspect property in enforcement of the act;
To restrict pesticide usage;
To establish certification standards;
To categorize and certify commercial applicators;
To enforce the act.

CERTIFICATION OR LICENSING:

All commercial applicators must be certified by written examination;
Categories of custom applicators and herbicide applicator are established.

PROHIBITED ACTS:

To engage in custom application of pesticides without certificate;
To violate other act provisions and regulations.

EXEMPTIONS:

Use of pesticides on lawns, trees, and shrubs;
Structural pest control not covered by this act.

PENALTIES:

Fines of from $100 to $300 or six months in jail.

OKLAHOMA RADIATION

TITLE:

Ionizing Radiation Protection Law
Oklahoma Statutes

PURPOSE:

To provide for a program of ionizing radiation and occupational health control.

DEFINITIONS:

1. Atomic energy
2. By-product material
3. Production facility
4. Special nuclear material
5. Utilization facility
6. Ionizing radiation
7. Source of radiation
8. Radiation hazard
9. Source material

ADMINISTERING AUTHORITY:

State Board of Health
Radiation Advisory Committee

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To establish safety levels of radiation exposure;
To regulate the handling and storage of radiation sources;
To approve plans and issue permits for use of radiation sources;
To conduct studies concerning electronic product radiation;
To generally enforce the act.

PROHIBITED ACTS:

To violate the terms of any permit or license;
To fail to register radiation sources when required;
To violate other act provisions.

PENALTIES:

NRC AGREEMENT STATE: No

OKLAHOMA SOLID WASTE

TITLE:

Solid Waste Management Act
Oklahoma Statutes 63-2251

PURPOSE:

To regulate the collection and disposal of solid wastes in a manner that will protect public health and welfare, and prevent water and air pollution.

DEFINITIONS:

1. Board
2. Department
3. Person
4. Solid waste
5. Disposal site
6. Solid waste management system

ADMINISTERING AUTHORITY:

State Department of Health
Solid Waste Management Advisory Committee

AUTHORIZATIONS:

To consult with and cooperate with other state and federal agencies;
To act as a state lead agency in solid waste matters;
To develop a statewide solid waste management plan;
To approve plans for local solid waste disposal facilities;
To supervise local solid waste disposal sites;
To issue regulations pursuant to the act;
To supervise closure of local facilities.

PROHIBITED ACTS:

To dispose of solid waste other than at a proper facility;
To dispose of hazardous wastes from out of state;
To violate any other act provisions.

PENALTIES:

Fines of up to $200 or 30 days in jail.

OKLAHOMA WASTE WATER

TITLE:

Water and Sewage Works Operators Certification Act
Oklahoma Statutes 59-11-02

PURPOSE:

To provide for the classification of water and sewage works and to provide for the certification of operators of such facilities.

DEFINITIONS:

1. Operator
2. Plant
3. Water works
4. Sewage works
5. Board
6. Commissioner
7. Person
8. Certificate

ADMINISTERING AUTHORITY:

State Board of Health
Operators Advisory Council

AUTHORIZATIONS:

To conduct and coordinate educational and training programs;
To establish certification standards;
To classify water and sewage works;
To certify water and sewage works operators.

CERTIFICATION OR LICENSING:

Operators of water and sewage facilities must be certified; examination and showing of competence is required.

PROHIBITED ACTS:

To operate a water or sewage works facility without a properly certified operator;
To perform the duties of an operator without being properly certified;
To violate any other act provisions or regulations.

PENALTIES:

Fines of up to $100 or 30 days in jail.

OKLAHOMA WASTE WATER

TITLE:

Water Pollution Control Laws
Oklahoma Statutes

PURPOSE:

To provide the control of sewage and other discharges into water to protect the quality of waters of the state.

DEFINITIONS:

1. Board
2. Department
3. Commissioner
4. Local health officer
5. Person
6. Waters of the state
7. Sewage
8. Reservoir
9. Drainage basin
10. Waste water

ADMINISTERING AUTHORITY:

State Department of Health

AUTHORIZATIONS:

To issue regulations and adopt standards for drinking water supplies;
To maintain and operate laboratories;
To make water pollution studies;
To issue permits for sanitary, sewer, solid waste, sewage or waste treatment plant construction;
To issue permits for sewage discharge;
To control water discharges and other water pollution;
To generally enforce the law.

PROHIBITED ACTS:

To cause or allow pollution of any water supply source;
To undertake any sewer, solid waste, or waste treatment construction without permit;
To violate the terms of any permit;
To dump garbage or trash within any drainage basin;
To violate any other act provisions.

PENALTIES:

General violations - fines of up to $200 or 30 days in jail;
Permit requirement violations - fines of up to $500 or six months in jail.